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## CONTENTS

	Page
INTRODUCTION . . . . .	xi
<u>AGRICULTURAL CHEMISTRY</u>	
A STUDY OF SOME CHEMICAL AND PHYSICAL PROPERTIES OF THE CLAY MINERALS, ATTAPULGITE, SAPONITE AND NONTRONITE . . . . .	1
Orval Graham Caldwell	
THE EFFECT OF CERTAIN CULTURAL PRACTICES ON THE ASCORBIC ACID CONTENT OF SOME HORTICULTURAL PLANTS . . . . .	3
Frank Baker Cross	
A STUDY OF THE STEROLS, STEROLINS, AND CERTAIN ALCOHOLS OF SOME LEGUME SEED OILS. . . . .	5
L. Carroll King	
EXPERIMENTS WITH X-RAY TREATMENTS ON THE SEEDS OF CERTAIN CROP PLANTS . . . . .	8
Wendell Russel Tascher	
<u>BACTERIOLOGY</u>	
OPTIMAL CARBON DIOXIDE TENSIONS FOR PRIMARY ISOLATION OF THE GONOCOCCUS: RESPONSE OF THE ORGANISM TO OTHER GASEOUS ENVIRONMENTS . . .	11
W. W. Ferguson	
BIOLOGICAL ACTIVITIES OF BACTERIA ISOLATED FROM WATER SUPPLIES . . . . .	13
Oliver Herdlen Peterson	
<u>BIOLOGICAL CHEMISTRY</u>	
THE INTERMEDIARY METABOLISM OF HISTIDINE AND SOME RELATED IMIDAZOLE DERIVATIVES . . . . .	15
William Jefferson Darby, Jr.	
SOME ASPECTS OF THE KAHN REACTION WITH ANIMAL SERA AND NONSYPHILITIC HUMAN SERA. . . . .	17
Stanley Marcus	

BIOLOGICAL CHEMISTRY (Cont'd)

- THE PREPARATION AND QUANTITATIVE DETERMINATION  
OF THE ESTROGENS . . . . . 20

Alan Mather

- CHANGES IN THE NITROGENOUS CONSTITUENTS OF THE  
URINE FOLLOWING THE ADMINISTRATION OF AMINO  
ACIDS . . . . . 22

Andrew A. Ormsby

- I. THE ULTRAVIOLET ABSORPTION OF VITAMIN K<sub>1</sub>  
AND THE EFFECT OF LIGHT. II. THE QUANTITATIVE  
CHROMATOGRAPHIC DETERMINATION OF VITAMIN D IN  
FISH LIVER OILS . . . . . 24

Frank Sargent Tomkins

- THE EFFECT OF ULTRAVIOLET AND INFRARED RADIA-  
TION TO THE THIN FILMS AND INFRARED ABSORPTION  
OF CERTAIN OILS. . . . . 25

Nelson Ging

CHEMISTRY

- THE ACTION OF ALKALI ON CYCLOHEXENECARBONALS  
1,1-DICARBOXYLATES AND SPIRO-BARBITURATES. . 27

Dudley M. Gallagher

- THE LOW PRESSURE CATALYTIC HYDROGENOLYSIS OF  
ESTERS . . . . . 31

John William Hodge

- A STUDY OF THE WAX OF THE NELUMBO PENTAPETALA 34

Sister Agnes Marie Horner

- A PHYSICO-CHEMICAL METHOD FOR THE DETERMINA-  
TION OF THE VITAMIN D POTENCY OF FISH OILS . 36

Gerald Vaughan Kingsley

- A STUDY OF MERCURY-OIL EMULSIONS . . . . . 37

Amos L. Lingard

- THE PYROLYSIS OF PROPANE . . . . . 40

Stuart McLain

- THE CONDENSATION OF THE METHYL DIPROPYL  
CARBINOLS WITH PHENOL IN THE PRESENCE OF  
ALUMINUM CHLORIDE . . . . . 43

Carl Ridge Meloy



# CONTENTS

v

Page

## CHEMISTRY (Cont'd)

REACTIONS OF  $\beta$ -ENYNE HYDROCARBONS . . . . . 45

Chapin E. Stevens

THE PREPARATION OF ALKYL AND ALKAMINE ESTERS  
OF P-AMINO CINNAMIC ACID. . . . . 47

Louis Leon Sulya

## COMMUNICATIONS

PHASES OF INTERNATIONAL LAW AFFECTING THE FLOW  
OF INTERNATIONAL NEWS COMMUNICATIONS. . . . . 48

William Finley Swindler

## ECONOMICS

ADMINISTRATIVE CONTROL OF STATE EXPENDITURES. 50

John Tyler Caldwell

THE OFFICE OF COUNT OF THE PRIVY PURSE IN THE  
LATE ROMAN EMPIRE . . . . . 53

George R. Monks

## EDUCATION

JUNIOR COLLEGE PROVISIONS FOR ADULT EDUCATION. 56

Burke W. Bradley

AN ANALYSIS OF THE EXTENT TO WHICH PRACTICES  
RECOMMENDED IN BOOKS ON HIGH SCHOOL TEACHING  
METHODS ARE BASED ON PSYCHOLOGICAL PRINCIPLES. 59

Claude Maurice Dillinger

DESCRIPTION AND PREDICTION OF PHYSICAL DE-  
VELOPMENT IN SCHOOL BOYS . . . . . 62

Marguerite F. Hall

THE HISTORY OF THE UNIVERSITY OF TOLDEO. . . 65

Frank R. Hickerson

THE HISTORY OF INSTRUCTION IN AMERICAN LITERA-  
TURE IN COLLEGES AND UNIVERSITIES OF THE  
UNITED STATES 1827-1939. . . . . 68

John Smith Lewis, Jr.

EDUCATIONAL OPPORTUNITIES IN MISSOURI PUBLIC  
AND NON-PUBLIC HIGH SCHOOLS. . . . . 70

Charles Willard McLane

EDUCATION (Cont'd)

- THE DOCTRINE OF THE SEPARATION OF POWERS WITH  
SPECIAL REFERENCE TO ITS APPLICATION TO THE  
DELEGATION OF LEGISLATIVE POWER TO EDUCATIONAL  
OFFICIALS . . . . . 72  
Blaine Blair Nolan

- AN ANALYSIS OF THE MEANING OF AVERAGENESS IN  
A COLLEGE APTITUDE TESTING PROGRAM. . . . . 75  
Mildred Winn Saupe

- INTERSCHOLASTIC CONTEST PRACTICES IN PUBLIC  
HIGH SCHOOLS IN MISSOURI. . . . . 77  
Lauren Andrew Van Dyke

- CATHOLIC INDIAN MISSIONARY INFLUENCE IN THE  
DEVELOPMENT OF CATHOLIC EDUCATION IN MON-  
TANA, 1840-1903 . . . . . 81  
Sister Mary Afra White

ELECTRICAL ENGINEERING

- CURRENT DISTORTION IN THE END-RINGS OF  
SQUIRREL-CAGE INDUCTION MOTORS. . . . . 83  
Richard John Walter Koopman

GEOLOGY

- THE STRATIGRAPHY OF THE WESTERN HALF OF THE  
FULTON QUADRANGLE . . . . . 85  
Trusten Edwin Peery

- PLEISTOCENE GLACIAL DEPOSITS AND PREGLACIAL  
DRAINAGE PATTERN OF NORTHWESTERN MISSOURI . . 88  
Raymond Maxwell Trowbridge

HISTORY

- THE HELGOLAND-ZANZIBAR TREATY OF 1890 . . . . 91  
Paul Edgar Hubbell

- THE ANTI-CLERICAL ACTIVITIES OF THE FORTY-  
EIGHTERS IN WISCONSIN 1848-1860. A STUDY  
IN GERMAN-AMERICAN LIBERALISM . . . . . 94  
Sister M. Hedwigis Overmoehle



## CONTENTS

vii  
Page

### HISTORY (Cont'd)

- THE JACOBAN OATH OF ALLEGIANCE AND ENGLISH  
CATHOLICS . . . . . 96  
Clarence James Ryan, S.J.

### HISTORY, AMERICAN

- THE LIQUOR TRAFFIC AMONG THE ABORIGINES OF  
THE NEW NORTHWEST 1800-1860 . . . . . 98  
Joseph Peter Donnelly, S.J.

### HORTICULTURE

- ANATOMICAL DEVELOPMENT OF THE SKIN OF  
POMACEOUS FRUITS WITH SPECIAL REFERENCE  
TO SPRAY RESIDUE REMOVAL. . . . . 100  
Seth Thomas Shaw

### LANGUAGES, LATIN

- A STUDY OF THE LATINITY OF NARRATIO RESTAURA-  
TIONIS ABBATIAE SANCTI MARTINI TORNACENSIS. . 103  
Richard Eugene Arnold, S.J.
- SANCTI AELREDI DE SPIRITALI AMICITIA LIBRI  
TRES: INTRODUCTION, TEXT, TRANSLATION, AND  
COMMENTARY. . . . . 105  
Sister Mary Eugenia Laker

### LITERATURE

- THE DECLINE OF TRAGEDY IN THE EARLY NINETEENTH  
CENTURY . . . . . 107  
George E. Grauel
- A REINTERPRETATION OF THE ROMAN DE LA ROSE: A  
STUDY IN CHAUCERIAN BACKGROUND. . . . . 109  
Alan Murray Finlay Gunn

### LITERATURE, AMERICAN

- CENSURE OF MAJORITY RULE AS A THEME IN  
AMERICAN LITERATURE 1787-1853 . . . . . 112  
Robert Goyer Walker



LITERATURE, ENGLISH

- SPENSER AND THE EMBLEM WRITERS . . . . . 115  
Sister Mary Louise Beutner

PHILOSOPHY

- THE BACONIAN MIND IN EARLY NINETEENTH CENTURY  
AMERICA. . . . . 117  
Bernard Baum
- THE CONCRETE UNIVERSAL AS A LOGICAL PRINCIPLE 119  
Wm. Vander Lugt

PHOTOGRAPHY

- THE INFLUENCE OF PRESSURE ON THE FORMATION OF  
THE LATENT PHOTOGRAPHIC IMAGE, PARTICULARLY  
ITS EFFECT ON REVERSAL IN THE REGION OF SOLAR-  
IZATION. . . . . 121  
Karl A. Maring, S.J.

POLITICAL SCIENCE

- THE IMPLEMENTATION OF THE MONROE DOCTRINE. . 123  
Melvin Henry Arthur Laatsch

PUBLIC HEALTH

- A STUDY OF THE ADMINISTRATIVE CONTROL OF  
WHOOPIING COUGH IN GRAND RAPIDS . . . . . 127  
John Leonard Lavan

RELIGION

- VOLTAIRE, THE EXAMEN AND ANALYSE . . . . . 129  
E. Judson Humeston, Jr.
- THE "POLYGLOT" ARABIC TEXT OF ZECHARIAH--A  
COMPARATIVE AND CRITICAL STUDY . . . . . 132  
Stephen M. Reynolds

SOCIOLOGY

- THE ENGLISH COUNTRY GENTRY: A SURVEY WITH  
SPECIAL REFERENCE TO THEIR SOCIAL CODE . . . 135  
Paolo Enrico Coletta

# CONTENTS

ix

Page

## SOCIOLOGY (Cont'd)

THE AMERICAN COLONY IN MEXICO CITY . . . . . 137

Ethelyn Clara Davis

SUBJECTIVE FACTORS OF DELINQUENT CONDUCT: AN  
ADAPTATION OF "OWN STORY" AND INTERVIEW  
METHOD TO THE DIAGNOSIS AND REHABILITATION OF  
DELINQUENT BOYS. . . . . 139

Ralph Aloysius Gallagher, S.J.

THE DEVELOPMENT OF A TECHNIQUE FOR EVALUATING  
THE ORGANIZATION OF DIOCESAN CATHOLIC SOCIAL  
INSTITUTIONS . . . . . 140

Weltha M. Kelly

THE ECOLOGICAL DISTRIBUTION OF TALENTED  
PERSONS IN THE UNITED STATES . . . . . 141

Arthur Hampton Robertson

TREATMENT OF LIFE INSURANCE PROBLEMS BY  
SOCIAL AGENCIES DEALING WITH DEPENDENT  
FAMILIES . . . . . 144

Flora L. Slocum

## ZOOLOGY

SEASONAL AND EXPERIMENTALLY INDUCED CHANGES  
IN THE REPRODUCTIVE TRACT OF THE FEMALE BAT  
MYOTIS GRISESCENS. . . . . 146

Jane Colburn Belcher

ALTERATIONS IN THE BLOOD, AND IN THE WATER,  
FAT, AND CHLORIDE CONTENT OF TISSUES DURING  
DEHYDRATION IN THE DOG . . . . . 148

Benjamin DeBoer

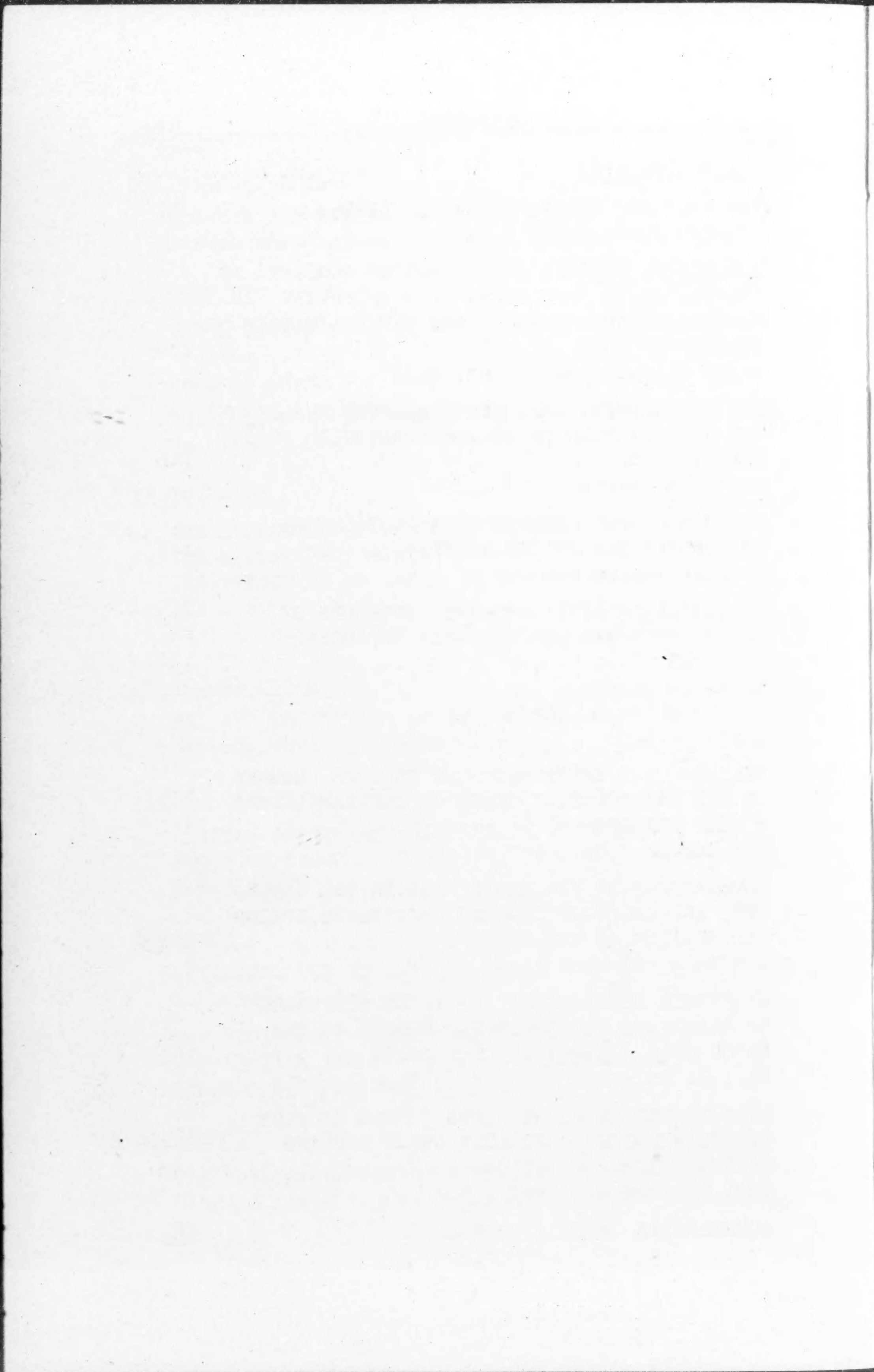
EMBRYONIC DEVELOPMENT AND ADULT MORPHOLOGY  
OF BLOOD AND BLOOD-FORMING ORGANS IN THE  
FROG, Rana pipiens . . . . . 151

Paul H. Ralph

PERIODICITY OF SPONTANEOUS CHANGE OF FORM  
OF PELMATOHYDRA OLIGACTIS UNDER VARYING  
PHYSIOLOGICAL CONDITIONS . . . . . 153

Rev. Raymond Hugo Reis, S.J.

CUMMULATIVE INDEX OF TITLES. . . . . 155





## INTRODUCTION

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Any suggestions in this regard will be greatly appreciated.





## AGRICULTURAL CHEMISTRY

### A STUDY OF SOME CHEMICAL AND PHYSICAL PROPERTIES OF THE CLAY MINERALS, ATTAPULGITE, SAPONITE AND NONTRONITE

Orval Graham Caldwell, Thesis (Ph.D.)  
University of Missouri, 1942

Investigations were conducted upon nontronite clay from Sandy Ridge, North Carolina, attapulgite clay from Attapulcus, Georgia and saponite clay from Hector, California.

The nontronite clay has a 2:1 lattice structure type of the  $\text{Si}_2\text{O}_5$  silicate group, and is an intermediate member of the beidellite-nontronite isomorphous series. Attapulgite clay has an amphibole-like structure and is a member of the attapulgite-sepiolite series of the  $\text{SiO}_3$  silicate structure group. The montmorillonite series should be extended to include the magnesium end member, saponite. The clay from Hector, California is classified as one of the saponites.

The charge developed on the nontronite clay by aluminium replacing silicon in the silica sheet was partially balanced by excess trivalent atoms in the gibbsite sheet. The substitution of aluminium for silicon in the attapulgite clay gave a negative charge which was incompletely neutralized by the excess of trivalent atoms in the modified brucite sheet. The negative charge on the saponite clay was developed by aluminium replacing silicon and by a deficiency of atoms in the brucite sheet.

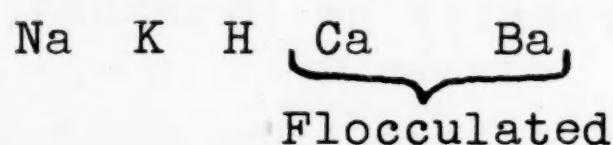
The exchangeable cations balanced the negative charge on all the clay fractions; and the theory of charge development through lattice replacement may be extended to the amphibole-like clays.

The clays of the montmorillonite-saponite series may be distinguished from those of the

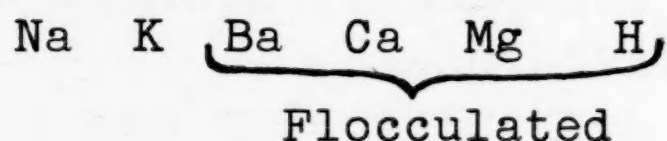
beidellite-nontronite series by the lattice charge distribution. In the latter the charge is based principally on the silica sheets, in the former it is located for the most part on the brucite sheets.

A hydrogen system may be developed by electrodialysis of nontronite and attapulgite clays, but it decomposes saponite clay.

Hydrogen nontronite clay is flocculated by exchangeable cations in the order



and hydrogen attapulgite clay in the order



Titration curves, characteristic of expanding clays, were obtained for nontronite and attapulgite clays; and their variation with the different bases employed, indicated that these clays are weak acids. A marked decline of the pH values, above 6.0 to 7.0, with time, was shown by the clay suspensions. This indicates a reaction with the OH groups of the lattice. The base exchange capacity, as determined by neutral electrolytes was given below a pH of 7.0 by the titration curves.

The dehydration curves of the clay fractions indicated that previous treatment affected the quantity of adsorbed water even when the clay was heated as high as 500°C. The clay films retained larger quantities of water at 110°C than the same film when ground.

Refractive index determinations of the clay fractions, dried and in suspension gave some diagnostic results. A comparison of clay index values, following electrodialysis, gave some indication of clay stability. Clays dried at different temperatures showed a great variation in the index values of the flakes. These index curves, supplementing the hydration curves aid in ascertaining the probable number of OH groups in the lattice.

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THE EFFECT OF CERTAIN CULTURAL PRACTICES ON THE  
ASCORBIC ACID CONTENT OF SOME HORTICULTURAL  
PLANTS

Frank Baker Cross, Thesis (Ph.D.)  
University of Missouri, 1939

This investigation involved the relationship between soil fertility and texture and the vitamin C content of fruits and vegetables grown therein. A preliminary investigation involved chemical analysis for ascorbic acid of a wide variety of fruits and vegetables of plants (both cultivated and wild) not commonly used for food, of parts of plants, of different plants of the same variety, and of different fruits from the same plant.

Ascorbic acid content was estimated by titration, using the method of Tillmans (1932) as perfected by Bessey and King (1933) and Menaker and Guerant (1938). Material analyzed in the preliminary survey was grown at or near Columbia, Missouri, and Stillwater, Oklahoma. Plants used in the fertilizer and soil texture experiments were grown in 6-inch pots in a greenhouse, using white sand, loess soil, and peat. Nutrient solutions were added as required for daily watering.

Lettuce maintained a uniform concentration of ascorbic acid regardless of fertilizer treatment and soil differences. Mustard, spinach, and Brussels sprouts gave very little uniformity of response, except a general association of higher concentration with good growth following complete fertilizer applications. Unbalanced fertilizers for the most part resulted in plants of the foregoing species having a lower vitamin C concentration, and had a similar effect on tomato fruits. Tomato fruits from plants receiving a complete fertilizer application had approxi-

mately the same concentration as those from plants receiving no fertilizer. Fruits of Ruby King pepper plants receiving a complete fertilizer had lower concentrations than those from plants receiving no fertilizer.

In the preliminary survey, varieties of the same kinds of fruits or of vegetables, and also plants and parts of plants of the same variety, were found to differ widely in concentration of ascorbic acid. Parts of individual fruits also varied considerably. Age, degree of maturity of parts, and ripeness of fruits also affected concentrations.

Among the best sources of ascorbic acid found in these tests were persimmon, cabbage, collards, kohlrabi, parsley, pepper, spinach, tomato, turnip, and strawberry. Other plants having a high concentration were rose fruits, poke leaves, bittersweet fruit, iris, bryophyllum, peony, sour dock, and persimmon leaves.

Vegetables and fruits for which ascorbic acid analyses are reported, in addition to those referred to in the foregoing paragraphs, included from one to a dozen or more varieties of each of the following: apples, snap beans, beets, carrots, chicory, cress, dandelion, egg plant, endive, grapes, onions, peaches, pears, peas, plums, potatoes, radishes, raspberries, strawberries, sweet corn, swiss chard, turnips, and youngberries. Products purchased in the market for analysis included most of the foregoing, and also parsnips, salsify, squash, sweet potatoes, bananas, cranberries, and quinces. About fifty plants not commonly used for food were also analyzed. Analyses are reported in terms of milligrams per kilogram.

As a result of these analyses and experiments, it is concluded that varying the fertilizer application to vegetable plants offers little possibility of altering the vitamin C content of such plants, particularly in view of the great variation in concentrations among varieties of the same species, parts of the same plant, and even parts of the same fruit.

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A STUDY OF THE STEROLS, STEROLINS, AND CERTAIN  
ALCOHOLS OF SOME LEGUME SEED OILS

L. Carroll King, Thesis (Ph.D.)  
Michigan State College, 1942

The sterol composition of seed from two varieties of alfalfa (Hardigan alfalfa seed and Grim alfalfa seed) and from two species of clover (Medium Red clover seed and Dutch White clover seed) was examined.

Hardigan alfalfa seed on ethyl ether extraction gave 10.6% of a greenish-yellow oil. About 4.3% of this oil was unsaponifiable. From this unsaponifiable fraction there was isolated  $\alpha$ -spinasterol, I, ( $C_{29}H_{47}OH \cdot \frac{1}{2}H_2O$ , m.p. 168-169°,  $[\alpha]_D^{27} = -2.68^\circ$  in  $CHCl_3$ ; acetate, m.p. 180-182°,  $[\alpha]_D^{21} = -6.35^\circ$  in  $CHCl_3$ ; benzoate, m.p. 196-199°,  $[\alpha]_D^{19} = 2.2^\circ$  in  $CHCl_3$ ),  $\beta$ -spinasterol, II, ( $C_{29}H_{47}OH \cdot \frac{1}{2}H_2O$ , m.p. 148-150°,  $[\alpha]_D^{20} = 5.91^\circ$  in  $CHCl_3$ ; acetate,  $C_{31}H_{50}O_2$ , m.p. 153-155°,  $[\alpha]_D^{19} = 5.10^\circ$  in  $CHCl_3$ ; benzoate,  $C_{36}H_{52}O_2$ , m.p. 181-183°,  $[\alpha]_D^{19} = 7.51^\circ$  in  $CHCl_3$ ), and a new sterol,  $\delta$ -spinasterol, III, ( $C_{29}H_{47}OH \cdot \frac{1}{2}H_2O$ , m.p. 143-145°,  $[\alpha]_D^{19} = 6.15^\circ$  in  $CHCl_3$ ; acetate,  $C_{31}H_{50}O_2$ , m.p. 132-133°,  $[\alpha]_D^{16} = 0.82^\circ$  in  $CHCl_3$ ; benzoate,  $C_{36}H_{52}O_2$ , m.p. 165-168°,  $[\alpha]_D^{19} = 11.17^\circ$  in  $CHCl_3$ ). The acetates of both II and III on catalytic reduction gave  $\alpha$ -stigmastenyl acetate, IV, ( $C_{31}H_{52}O_2$ , m.p. 115-116°,  $[\alpha]_D^{17} = 9.95^\circ$  in  $CHCl_3$ ) and IV on saponification gave  $\alpha$ -stigmastenol, V, ( $C_{29}H_{49}OH$ ,



m.p. 111-112°,  $[\alpha]_D^{15} = 21.17^\circ$  in  $\text{CHCl}_3$ ). The amounts of the three isomeric sterols, I, II and III, present in Hardigan alfalfa seed oil unsaponifiable were 7.4%, 12.0% and 1.8%, respectively. A singly unsaturated alcohol, VI, ( $\text{C}_{29}\text{H}_{47}\text{OH}$ , m.p. 194-196°,  $[\alpha]_D^{18} = 86.5^\circ$  in  $\text{CHCl}_3$ ; acetate,  $\text{C}_{31}\text{H}_{50}\text{O}_2$ , m.p. 238-239°,  $[\alpha]_D^{19} = 79.8^\circ$  in  $\text{CHCl}_3$ ), and a substance which appeared to be a hydrocarbon were also isolated in small amounts from the unsaponifiable fraction of Hardigan alfalfa seed oil.

Hardigan alfalfa seed oil on long standing in the refrigerator deposited 0.17% of a polyhydroxy alcohol, VII, (m.p. 274-277° with decomposition; acetate, m.p. 160-162°), which proved to be a phytosterolin. On acid hydrolysis, VII gave a reducing substance which formed a crystalline osazone and a sterol mixture from which I was isolated.

As far as could be determined the sterol composition of Grim alfalfa seed oil was identical with that of Hardigan alfalfa seed oil. The oil gave 0.19% of VII, (m.p. 260-270° with decomposition; tetraacetate, m.p. 162-163°,  $[\alpha]_D^{21} = 7.92^\circ$  in  $\text{CHCl}_3$ ). The unsaponifiable fraction of the oil gave 6.3% of I, 10.0% of II and 1.6% of III.

On ethyl ether extraction Dutch White clover seed gave 7.7% of a greenish-yellow oil. About 3.8% of this oil was unsaponifiable. From this unsaponifiable fraction there was isolated 33.0% of crude sterols. A portion of the crude sterols was acetylated and brominated. After standing over night in the refrigerator, about 10.0% of a crude acetate tetrabromide, VIII, (m.p. 192-196°) separated. VIII on debromination gave stigmasteryl acetate, IX, (m.p. 137-139°,  $[\alpha]_D^{18} = -58.4^\circ$  in  $\text{CHCl}_3$ ). IX on saponification gave stigmasterol, X, (m.p. 162-164°,  $[\alpha]_D^{25} = -50.76^\circ$  in  $\text{CHCl}_3$ ).

Dutch White clover seed oil on long standing in the refrigerator deposited 0.44% of a polyhy-

droxy alcohol, XI, (m.p. 280-290° with decomposition; acetate, m.p. 161-163°,  $[\alpha]_D^{21} = -26.3^\circ$  in  $\text{CHCl}_3$ ),

which proved to be a phytosterolin, probably trifoli-anol. XI on acid hydrolysis gave a reducing substance and a sterol mixture. This sterol mixture on acetylation and bromination gave VIII, and the VIII so isolated on debromination and saponification gave IX and X.

As far as could be determined the sterol composition of Medium Red clover seed oil was identical with that of Dutch White clover seed oil. The oil gave 0.11% of XI. The unsaponifiable fraction of the oil gave 43.0% of crude sterols. One gram of these crude sterols on acetylation and bromination gave 96 mg. VIII.

Excess Hanus iodine solution reacted with I in such a way that the amount of halogen used up depended on the excess halogen present at the beginning of the reaction. II, III and V and their acetates as well all reacted with Hanus iodine solution in the same manner. A characteristic dark green color, which developed in the chloroform layer of the above reaction, was used as a qualitative test for sterols having unsaturation at or near positions 8 - 14 in Ring C.

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## AGRICULTURE

### EXPERIMENTS WITH X-RAY TREATMENTS ON THE SEEDS OF CERTAIN CROP PLANTS

Wendell Russel Tascher, Thesis (Ph.D.)  
University of Missouri, 1929

The purpose of these experiments was to survey the general effects of X-rays on plants to provide information relative to (1) dosage requirements and the use of environmental factors which modify the physiological and morphological responses of plants, (2) the possibility of increasing crop yields of economic value, and (3) the effectiveness of X-rays in controlling seed-borne diseases.

Dormant and germinating seeds were X-rayed with different intensities of continuous and intermittent doses and at different temperatures, the results being determined by plant development under a range of environmental conditions.

The half killing doses (those preventing the development of one-half the seedlings) for twenty-four important field crops including eight botanical families varied from 4,000 to 85,000 r-units for rye and alsike clover, respectively. Species of Triticum, Avena, and Pinus varied widely in their tolerance to X-rays.

Pollen of different species of corn was almost completely killed by doses of 6000 r-units, 1200 r-unit doses were near the maximum permitting fertilization in corn, 1000 r-units practically prevented fertilization of durum wheat, and a dose of 4,000 r-units was near the upper limit for the survival of grafted cherry and apple clons.

Sensitivity to X-rays increased most rapidly during the early stages of germination. Temperature applied to seeds during X-ray treatments modified their biological reactions. increasing the tolerance

with low temperatures. X-rayed dormant and germinating seeds deteriorated more rapidly when stored at high temperatures. Continuous X-ray doses were approximately twice as destructive as equivalent intermittent doses to germinating barley seeds but were less destructive when applied to dormant seeds. Short intervals between intermittent doses were less destructive than long intervals on dormant barley seeds. A large number of small doses was less injurious than a smaller number of larger doses on germinating barley seeds. The deterioration of X-rayed dormant seed during a twelve weeks' storage period was determined.

Morphological effects of X-rays observed during the course of treatments were described.

X-ray doses given dormant timothy seeds did not affect seedling growth as determined by their plumule lengths at the end of eight days' germination. Two of the fifty-four yields considered were statistically superior and one was statistically inferior to their respective checks. These results were interpreted as indicating that X-rays of the intensities and qualities used did not influence crop yields.

The possibility of increased yields through a genic modification induced by X-rays is indicated by the appearance of an early maturing mutant of Triticum monococcum which may prove better adapted to certain environments.

The differential between the killing points by X-rays of the host and their parasites was found not sufficient to permit complete control of the organisms studied. The decreasing order of tolerance to X-rays of the fungi used in culture was: Fusarium moniliforme, Cephalosporium acremonium, Gibberella saubinetii, and Diplodia zeae. Supplementary treatments used to modify the fungus or host in order to obtain a more favorable difference in killing points were not successful. X-ray treatments of dormant wheat, barley, and oat seeds infected with Ustilago tritici, Tilletia levis, U. nuda and U. avenae, respectively, did not effect control.



X-ray treatments of germinating seeds significantly decreased the percentage of loose smut of oats and completely controlled loose smut of barley, although germination was decreased to as low as 5 per cent in the barley.

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## BACTERIOLOGY

### OPTIMAL CARBON DIOXIDE TENSIONS FOR PRIMARY ISOLATION OF THE GONOCOCCUS: RESPONSE OF THE ORGANISM TO OTHER GASEOUS ENVIRONMENTS

W. W. Ferguson, Thesis (Ph.D.)  
Michigan State College, 1942

Primary culture of the gonococcus, according to modern medical bacteriologists, is best accomplished in air reinforced with a carbon dioxide content of approximately 10 per cent. This dictum is adhered to almost slavishly by many workers, although there is evidence in the literature that a candle burned in an airtight jar furnishes sufficient carbon dioxide for optimum growth of the gonococcus.

It was proposed in this study to determine the limits of optimal carbon dioxide tensions for primary isolation of the gonococcus and to study the effect of such gases as carbon monoxide, hydrogen and nitrogen. As a necessary preliminary, the amount of carbon dioxide in a "candle" jar of six liters capacity was determined by gas analyses as 2.3 per cent. The determinations were made by absorption of carbon dioxide on ascarite.

The study was divided into three parts:

I. Comparison of the effect of atmospheric air, reduced oxygen tension and carbon dioxide.

a. The effect of moisture on "aerobic" strains of gonococci.

II. Determination of the optimal range of carbon dioxide stimulation.

a. Effect of carbon dioxide beyond the optimal range.

III. Effect of hydrogen and carbon monoxide compared with atmospheric air, reduced oxygen tension and carbon dioxide.

a. Effect of nitrogen compared with atmospheric air, reduced oxygen tension and carbon dioxide.

Comparisons were made by multiple plate counts of gonococci from acute cases of gonorrhea in men. The plate medium used throughout the study was Difco "chocolate" agar. Adequate spreading of inoculum was accomplished by sterile bent glass rods. In most cases practically a pure culture of gonococci was obtained. Identification was made by macroscopic inspection of the plates for typical colonies, by the oxidase reaction, and by the Gram stain.

Measurement of the different gases which went into the culture jars was accomplished by the U-type-open-manometer-method described by Leahy and Carpenter. Reduced oxygen tension was produced by partial vacuum.

The relative humidity in all closed culture jars was close to the saturation point.

It was found that equal growth of gonococci occurs in a jar in which a candle furnishes carbon dioxide and in a jar whose atmosphere is enriched with 10 per cent carbon dioxide. This confirms the observations of Christiansen and Schoenlein.

An increase in atmospheric moisture content was found to stimulate growth of aerobic strains of the gonococcus considerably.

In all the experiments in which a comparison was made of the efficacy of atmospheric air, reduced oxygen tension, and air reinforced with carbon dioxide, the latter condition was found to produce the best growth of gonococci.

Primary strains of the gonococcus were found to grow equally well on "chocolate" agar in a zone of carbon dioxide enrichment with a lower limit between 2.0 and 2.3 per cent and an upper limit between 18 and 20 per cent.

A moderate growth of gonococci was obtained in percentages of carbon dioxide as high as 40 per cent.

Hydrogen, carbon monoxide, and nitrogen gases in concentrations of 10 per cent in air did not contribute to the growth stimulation of gonococci.

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## BIOLOGICAL ACTIVITIES OF BACTERIA ISOLATED FROM WATER SUPPLIES

Oliver Herdien Peterson, Thesis (Ph.D.)  
University of Missouri, 1942

Typical coliform organisms and other bacteria of intestinal origin were isolated from water obtained from deep wells. The organisms isolated included typical *Escherichia*, typical *Aerobacter*, coliform intermediates, and intestinal organisms of the genera *Alcaligenes*, *Proteus*, and *Eberthella*. Two of the species isolated are reported in the literature as sometimes exhibiting pathogenic properties.

Organisms of known intestinal types have been isolated from water samples from which a negative presumptive test was obtained. The following organisms were isolated from such samples: *Eberthella dubia*, *Eberthella enterica*, *Eberthella oedematiens*, *Alcaligenes bookeri*, *Alcaligenes fecalis*, a slow-lactose-fermenting *Escherichia freundii* type, and *Aerobacter aerogenes*.

Alpha methyl d-glucoside, aconitic acid, and malonic acid, when used as a sole source of carbon, serve to differentiate the *Escherichia* section from the *Aerogenes* section.

Compounds which do not possess a hydroxyl or a carbonyl group were not fermented by any of the organisms studied. One organism fermented a monohydroxy dicarboxylic acid or malic acid. Several cultures fermented dehydroxy compounds. In general, those compounds possessing from 3 to 6 hydroxyl groups were fermented more readily. A compound with a gamma carbonyl group, levulinic acid, was not fermented, while a compound with an alpha carbonyl group, pyruvic acid, was fermented readily. Methylation of a carbohydrate interfered with the fermentation of that compound.



Aliphatic monocarboxylic acids of two or three carbon atoms were better sources of carbon than those containing a greater or lesser number of carbon atoms.

The trans form of unsaturated dibasic dicarboxylic acids of the general formula  $C_4H_4O_4$  were utilized more readily than the cis form, while the cis form of similar compounds having the general formula  $C_5H_6O_4$  were used more readily than the trans form.

The presence of a double bond or of a hydroxyl group increased the probability of utilization of a tricarboxylic acid as a source of carbon.

Hexoses were better sources of carbon than pentoses and the aldoses were better sources of carbon than the corresponding polyhydroxy alcohols.

Pyruvic acid was a better source of carbon than levulinic acid.

The addition of a hydrogen-acceptor to a synthetic medium containing formate did not enable any organism to produce visible gas from such a medium.

Citraconic acid may be used as a sole source of carbon for the differentiation of certain groups of coliform organisms.

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## BIOLOGICAL CHEMISTRY

### THE INTERMEDIARY METABOLISM OF HISTIDINE AND SOME RELATED IMIDAZOLE DERIVATIVES

William Jefferson Darby, Jr., Thesis (Ph.D.)  
University of Michigan, 1942

An extensive review of the discovery, isolation, synthesis, and biological importance of the naturally occurring imidazole derivatives is presented. The literature concerning the metabolism of l-histidine and of urocanic acid and substituted acrylic acids is summarized.

The preparation of 4(5)-hydroxymethylimidazole from fructose is described.  $\beta$ -4(5)-Imidazolyl-acrylic acid was synthesized by two methods: (1) the action of trimethyl amine and sodium hydroxide on  $\alpha$ -chloro- $\beta$ -[4(5)-imidazolyl]-propionic acid and (2) the decarboxylation of 4(5)-imidazolylmethylidene malonic acid in pyridine. Its properties were shown to be identical with those of two preparations of urocanic acid which had been isolated from (1) a culture of B. paratyphosus A inoculated into a histidine-rich medium and (2) the urine of rabbits following the feeding of l-histidine hydrochloride.

A method is described for the isolation of urocanic acid. Only 36 mg. of the compound were isolated from a culture of B. paratyphosus A to which 2.7 gm. of l-histidine monohydrochloride had been added. The complete identity of the isolated material with synthetic specimens confirms the report of Raistrick that this organism may convert histidine into urocanic acid.

Five of eight male rabbits excreted urocanic acid in the urine after oral administration of relatively large amounts (5-15 gm.) of l-histidine hydrochloride. All five of these animals showed signs of toxicity and four of them died during the period of the experiment. The signs and pathological



picture were similar to those produced by histamine. None of the animals which failed to excrete urocanic acid showed these signs of toxicity. No urocanic acid could be isolated from the urine of rabbits which had received l-histidine monohydrochloride subcutaneously.

Rats fed l-histidine monohydrochloride did not excrete urocanic acid or evidence toxicity. Guinea pigs did not excrete urocanic acid after subcutaneous injection of l-histidine monohydrochloride. Histidine was isolated from the urine of most of the animals of all three species following its administration.

Urocanic acid was not toxic when fed to or injected into rabbits or rats. The isolation from the urine of a considerable fraction of the injected substance indicated that it was excreted largely unchanged.

It is concluded that urocanic acid is not a quantitatively important intermediate in the normal breakdown of histidine by the rabbit or rat. Rather, it appears to be an abnormal product, the formation of which, in the rabbit, is accompanied by a toxic reaction which usually results in the death of the animal.

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SOME ASPECTS OF THE KAHN REACTION WITH ANIMAL SERA  
AND NONSYPHILITIC HUMAN SERA

Stanley Marcus, Thesis (Ph.D.)  
University of Michigan, 1942

A study has been made of some aspects of the positive reaction given by serological tests for syphilis with nonsyphilitic sera. Sixty to ninety per cent of the serum specimens of 102 chickens, 62 cows, 42 horses, 102 pigs and 49 rabbits, previously heated at 56°C. for 30 minutes, gave positive Kahn reactions, confirming the results of previous investigators. When these same sera were examined with the Kahn test at 1°C., reactions occurred in greater numbers. Thus, 100 per cent of the chicken, horse and pig sera, 98 per cent of the cow sera, and 94 per cent of the rabbit sera showed positive reactions at this temperature; the quantitative Kahn titers were also increased. When, however, the same sera were tested at 37°C., comparatively few positive reactions and low quantitative titers were obtained.

Unheated cow and pig sera generally gave Kahn reactions which were weaker than those given by the heated sera, while unheated chicken and rabbit sera in most instances gave reactions stronger than those of the heated sera. All the unheated animal sera investigated showed strongest reactions at 1°C. and weakest reactions at 37°C., with the exception of certain cow sera. Unheated cow sera showed a tendency toward zone reactions at 1°C., with flocculation in certain dilutions of serum with saline, but little or no flocculation when undiluted. This effect was removed by heating the sera for 30 minutes at 56°C.; it was not removed by dialysis of the serum against distilled water.

Globulin fractions of heated and unheated animal sera obtained by half saturation with  $(\text{NH}_4)_2\text{SO}_4$ , tended to give the same type of reaction despite the

fact that heated and unheated sera in an unfractionated state showed differences in reactivity. In general globulin fractions derived from animal sera showed zone reactions similar to those of unheated cow sera. On dialyzing the residual  $(\text{NH}_4)_2\text{SO}_4$  from the globulin fraction, this zone reactivity was removed, and the undiluted globulin fractions exhibited the usual behavior, giving stronger reactions than their dilutions.

Kahn-negative human sera were found to yield positive reactions in progressively increasing numbers by carrying out the test with heated sera at  $1^\circ\text{C}$ . (3.4 per cent); with unheated sera at  $1^\circ\text{C}$ . (6.0 per cent); with heated sera and sensitized antigen at  $1^\circ\text{C}$ . (14.9 per cent); with unheated sera and sensitized antigen at  $1^\circ\text{C}$ . (22.3 per cent); with the globulin fraction of heated sera at  $1^\circ\text{C}$ . and standard antigen (81.0 per cent); with the globulin fraction of heated sera at  $1^\circ\text{C}$ . and sensitized antigen (94.0 per cent).

Mixtures of human sera and antigen suspension (Kahn) which showed flocculation at  $1^\circ\text{C}$ . but not at  $37^\circ$  did not fix complement at  $37^\circ\text{C}$ ., indicating union of the reactants at  $1^\circ\text{C}$ . but not at  $37^\circ\text{C}$ .

Incubation at  $56^\circ\text{C}$ . of mixtures of serum and antigen (Kahn) showing flocculation resulted in the dissolution of the floccules, the extent of this reaction being inversely related to the serological titer. This reaction took place more readily with animal serum floccules than with floccules from syphilitic human sera. The heat-dissolved floccules from syphilitic sera remained capable of fixing complement, suggesting that the reactants were in a state of "soluble-union."

Floccules obtained from chicken, cow, horse and pig sera showed relatively little ability to fix complement. Floccules obtained from rabbit sera showed some tendency to fix complement; of 20 rabbits' sera giving positive Kahn reactions, 14 fixed complement.

Serological reactivity of young rabbits was found to be greatly reduced as compared with that of mature rabbits. Thirty-two rabbits, 50 to 60 days old, showed no reactions with the standard Kahn test,



but three of the sera gave weak reactions at 1°C. As the rabbits grew older the reactions increased in number and became more marked, especially at 1°C.

The pattern of serological reactivity in rabbits at 37°C., room temperature and 1°C. underwent a change following inoculation with Spirochaeta pallida. Before inoculation the reactions were strongest at 1°C. and weakest at 37°C.; within 90 days following inoculation, the reactions were stronger at 37°C. than at 1°C.

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## THE PREPARATION AND QUANTITATIVE DETERMINATION OF THE ESTROGENS

Alan Mather, Thesis (Ph.D.)  
Saint Louis University, 1939

Simplification of the method of preparation of crystalline estrogens from the urine of pregnancy has been attempted with the object of increasing the yields and decreasing the complexity of the procedure. This has necessitated the more particular study of the various phases of preparation, not only with the crude active material, but with the pure estrogens themselves, particularly in the hydrolysis of combined activity and the partitions between immiscible solvents.

Maximum yields for hydrolysis were found to depend upon conditions which have not heretofore been applied or recognized, and upon the relative rates of hydrolysis of inactive estrogen complexes and of destruction of the liberated estrogen itself. The extensiveness of these separate factors has been studied.

Consideration of the efficiencies of various extraction and purification procedures has included the determination of distribution ratios of pure theelin and theelol for various solvent pairs which have been or may be used in purification, and these data have proved valuable in predicting the expected efficiency of any proposed distribution step, upon which purification in a large measure depends. Efficiencies of these steps in routine preparations are given and methods outlined and discussed. The procedure includes a butanol extraction of the active fraction, hydrolysis, a primary separation--which may consist of a distribution of estrogen from organic solvent mixtures into alkali, or of a less quantitative but highly efficient purification by ethanol elution--



and ether-alkali partitions to a stage where crystallization of active compounds is possible.

From the partition data, a simple and accurate method for separating quantitatively theelin and theelol, and from that, determining separately the absolute amounts of each in urine, was developed, the determinations being made by bioassay. The method consists of an ether-extraction of hydrolysed urine, a single partition between 0.3 M sodium carbonate and benzene in which the alkali:solvent ratios for theelin and theelol are respectively 1:250 and 40:1, and assay of two or three samples in spayed mice. Since the corresponding ratio for dihydrotheelin is 1:30, the benzene fraction represents theelin plus dihydrotheelin, and the latter may be assayed after removal of the ketosteroid by suitable ketonic reagents.

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CHANGES IN THE NITROGENOUS CONSTITUENTS OF THE  
URINE FOLLOWING THE ADMINISTRATION  
OF AMINO ACIDS

Andrew A. Ormsby, Thesis (Ph.D.)  
University of Michigan, 1942

Amino acids were fed, singly and in mixtures, to rabbits, and the urine was analyzed to determine changes in the excretion of nitrogenous constituents. Glycine, alanine, arginine, ornithine, citrulline, glutamic acid, and asparagine were fed singly. The mixtures included citrulline and glycine, ornithine and glycine, and asparagine and citrulline. The twenty-four-hour output of urine was analyzed in three periods of six, six, and twelve hours, respectively, the following constituents being determined: total nitrogen, urea plus ammonia nitrogen, amino-nitrogen, and creatinine. The test substance was administered at the beginning of a twenty-four-hour period following two or more control days during which the animal was maintained on a basal diet of oats and cabbage.

There were two primary objectives for this investigation: to determine the relative rates of urea formation from various amino acids, and to throw some light on the mechanism (or mechanisms) of urea formation by means of in vivo experiments, the proposed mechanisms being based largely on in vitro work.

An increased excretion of urea after the administration of an amino acid is considered to indicate an increased formation of urea from the amino acid in question, although it is realized that such an excretion may be associated with specific dynamic action or toxic effects. It was found that the rate of urea formation varied with the amino acid fed. The most rapid excretion of extra urea followed the



administration of glutamic acid (single experiment) and asparagine. In the case of glutamic acid the results were complicated by the evident toxicity of the compound. Arginine, alanine, and ornithine also formed urea rapidly and were placed in an intermediate group. Most of the extra urea was excreted in the first twelve hours, with the least excretion during the third period. The results with glycine differed from those with the above amino acids in that the formation of urea was slight during the first six hours, and usually reached a maximum only in the last (twelve-twenty-four-hour) period. It was apparent that the metabolism of glycine differed from that of the other amino acids studied, at least during the first six hours.

The administration of citrulline was followed by small increases in extra urea excretion, the values in one instance being so low that it was doubtful if any extra urea had been formed. The feeding of mixtures of amino acids was followed by an excretion of extra urea corresponding very closely to that predicted on the assumption that the components of the mixture were metabolized independently. It was not possible to show any catalytic effect of ornithine or citrulline, such as might have been expected if the primary mechanism of urea formation, under the conditions imposed here, were the Krebs-Henseleit ornithine-citrulline-arginine cycle. The fact that the administration of citrulline gave rise to a slight excretion of extra urea, as contrasted with a relatively large excretion after ornithine, was interpreted as evidence against the Krebs cycle as the major factor here.

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I. THE ULTRAVIOLET ABSORPTION OF VITAMIN K<sub>1</sub> AND THE EFFECT OF LIGHT  
II. THE QUANTITATIVE CHROMATOGRAPHIC DETERMINATION OF VITAMIN D IN FISH LIVER OILS

Frank Sargent Tomkins, Thesis (Ph.D.)  
Michigan State College, 1942

I. The ultraviolet absorption spectrum of vitamin K<sub>1</sub> was reexamined and a previously unreported maximum at  $\lambda 239 \text{ m}\mu$  noted. A series of careful runs using purified hexane and samples of both the natural and synthetic vitamin K<sub>1</sub> showed that the  $E_{1\text{CM}}^{1\%}$  of the pure vitamin at  $\lambda 249 \text{ m}\mu$  is  $435 \pm 5$ . Tests carried out on solutions of the vitamin in carefully purified hexane showed that such solutions are stable upon standing in the dark for as long as five months. Ultraviolet absorption curves are presented showing the effect of ultraviolet radiation on hexane solutions of vitamin K<sub>1</sub> and evidence cited to show that the point of attack for the resulting decomposition is through the quinoid grouping of the vitamin K<sub>1</sub> molecule.

II. A method for the quantitative determination of vitamin D in fish liver oils is presented in which the oil is saponified, cooled and treated with digitonin to remove sterols, chromatographed to separate vitamins A and D, and the vitamin D determined by measuring the absorption at  $\lambda 500 \text{ m}\mu$  produced when the sample is added to a solution of antimony trichloride in chloroform. A table is presented showing the results obtained on a series of seventeen samples, using the procedure outlined above.

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THE EFFECT OF ULTRAVIOLET AND INFRARED RADIATION TO  
THE THIN FILMS AND INFRARED ABSORPTION  
OF CERTAIN OILS

Nelson Ging, Thesis (Ph.D.)  
Michigan State College, 1942

The object of this study is to find the compressibility and elasticity of a group of oils which are used as stickers of spraying material in insecticides. Some of the oils are rich in vitamins and the others are relatively less.

A few attempts have been made to examine the effect of the ultraviolet light and infrared radiation upon the thin film on the water surface by the hydrophil balance method. Characteristics of the film without any radiation means also have been measured. These curves given in figures all show a similarity of region transparency at the neighborhood  $3.5\mu$  to  $6\mu$ . This transparency is also shown in most organic compounds which have been determined by different people.

The absorption curves of corn oil and the high vitamin oil, 15,000  $\mu/g$  to 440,000  $\mu/g$  are about the same. This result has been checked at the University of Michigan by the same writer.

The effect of ultraviolet light on the corn oil, olive, cod liver, Vit. K, high Vit., and soy bean oils is quite prominent but it has relatively little effect on coconut, peanut, old corn oil and sesame oils. All of them have increased their film areas more or less by the effect of the ultraviolet light.

The effect of the ultraviolet light on the concentrated Vit. A oil is in the reverse direction. In other words, the area of film of concentrated Vit. A is rapidly decreased for a certain length of time.

The area of oil films is always increased even without ultraviolet or infrared radiation except

in the case of concentrated Vit. A oil, which increases its area. The degree of increasing and decreasing in area is greater when the oils are radiated either by ultraviolet or by infrared radiation.

The vegetable oils are in general more elastic than animal oils. Especially soy bean oil, aleic acid, and sesame oil are the most elastic among the vegetable oils under investigation. The elasticity and compressibility of the oils are lost at a certain pressure after the film has been pressed once or twice.

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## CHEMISTRY

### THE ACTION OF ALKALI ON CYCLOHEXENECARBONALS 1,1-DICARBOXYLATES AND SPIRO-BARBITURATES

Dudley M. Gallagher, Thesis (Ph.D.)  
University of Missouri, 1942

Although the cyclohexenecarbonals possess alpha hydrogens, one might reasonably expect reactions like those of the aromatic series toward alkaline reagents, because of the steric effect of the large radical attached to the alpha carbon. In order to test this supposition, the reactions with several 3-cyclohexenecarbonals, particularly the 3,4,6-trimethyl derivative, have been investigated. Concentrated aqueous solutions of sodium or potassium hydroxide acted on this aldehyde forming a tripolymer. Similar tripolymers of cyclohexanecarbal and of 3-cyclohexenecarbal had previously been prepared by the action of mineral acids.<sup>1</sup> Saturated aqueous solutions of barium hydroxide gave very small yields of the polymer, most of the aldehyde being recovered. A cold 10 per cent solution of potassium hydroxide in methyl alcohol was also without action on the aldehyde. At 70°, using a methyl alcohol-water solution, reaction took place with the formation of the corresponding acid and the alcohol. The acid had previously been prepared from ethyl crotonate and 2,3-dimethylbutadiene.<sup>2</sup> The structure of the alcohol was shown by its synthesis from the aldehyde using aluminum isopropoxide, and by carbon and hydrogen analyses of the naphthyl urethan.

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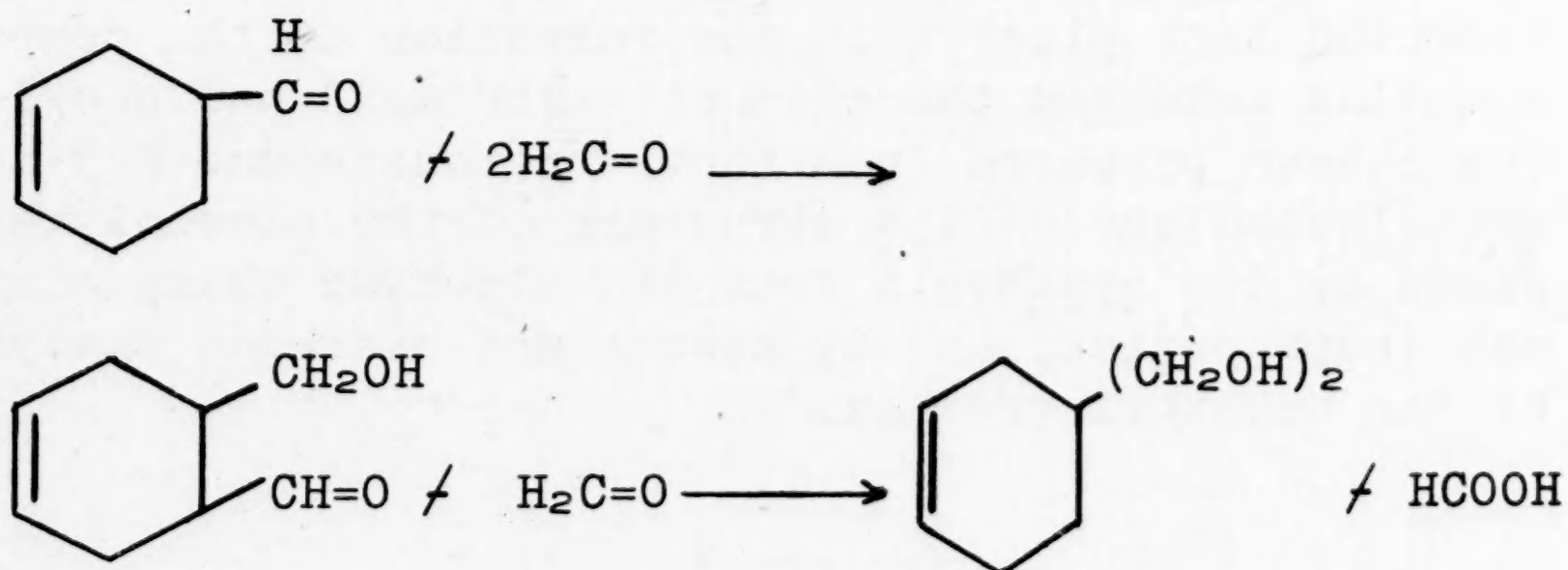
<sup>1</sup> Wallach, Ann., 347, 336 (1906); Zelinsky and Gutt, Ber., 40, 3051 (1907); Chayanov, J. Gen. Chem. (U.S.S.R.), 8, 460 (1938).

<sup>2</sup> Farmer and Pitkethly, J. Chem. Soc., 11 (1938).

Under similar conditions 3,4-dimethyl-6-phenyl-3-cyclohexenecarbal, 6-methyl-3-cyclohexenecarbal, and 3-cyclohexenecarbal were found to give the Cannizzaro reaction. In all cases the acids formed were known compounds<sup>3</sup> but the alcohols had not previously been reported. These were identified by their syntheses from the aldehydes using aluminum isopropoxide, and analyses of their phenyl or naphthyl urethans. Yields of the pure acids were of the order of 80 per cent. Varying amounts of polymerization products were obtained if the temperature of reaction was much in excess of 70°.

Freshly distilled 6-methyl-3-cyclohexenecarbal gave but a trace of reaction in the usual reaction time, while aldehyde used after long standing, or through which air had been bubbled, readily entered into the reaction. This is in accord with the observation that peroxide is a catalyst for the Cannizzaro reaction.<sup>4</sup>

Each of the aldehydes was dissolved in aqueous methyl alcohol and heated to approximately 70° with potassium hydroxide and formalin solution. Diols, in yields of from 50 to 60 per cent of the pure redistilled or recrystallized compounds, were obtained in all cases. The formation of these compounds presumably follows the course indicated by the equation



<sup>3</sup>Fujisi, Horiuchi, and Takahashi, Ber., 69, 2102 (1936); Chayanov and Grishiu, Colloid J. (U.S.S.R.), 3, 461 (1937); Perkin, J. Chem. Soc., 85, 416 (1904).

<sup>4</sup>Kharasch and Foy, This Journal, 57, 1510 (1935).



The molecular weight of 3,4,6-trimethyl-3-cyclohexene-1, 1-dicarbonyl in camphor and in dioxane was found to be 184 and 183.5, respectively, and in the Grignard machine was found to possess two active hydrogens. Each of the diols combined with two molecules of phenyl isocyanate to yield crystalline urethans. The ring unsaturation of the 3-cyclohexene-1, 1-dicarbonyl was reduced, and on oxidation the known cyclohexane-1, 1-dioic acid was obtained.<sup>5</sup>

### 1,1 Dicarboxylates

The diene synthesis (Diels-Alder reaction) making use of dienes and an olefin with unsymmetrically placed carbonyl groups, which has been studied, previously, in the case of diethyl methylene malonate, has been investigated using dienes and diethyl ethylidene malonate.

Diethyl ethylidene malonate was condensed with isoprene, 2,3-dimethyl-butadiene and cyclopentadiene to form the new adducts: diethyl 4 (3?), 6-dimethyl-cyclohex-3-ene-1, 1-dicarboxylate, diethyl 3,4,6-trimethyl-cyclohex-3-ene-1, 1-dicarboxylate and diethyl 3-methyl-bicyclo (2,2,1) hept-5-ene-2,2-dicarboxylate.

A new adduct, diethyl bicyclo (2,2,1) hept-5-ene-2,2-dicarboxylate, was prepared from cyclopentadiene and methylene malonate. In addition, three adducts were prepared from diethyl methylene malonate and isoprene, butadiene and 2,3-dimethyl-butadiene according to Bachman and Tanner's procedure.<sup>6</sup>

Four new compounds were obtained by hydrogenation of the corresponding unsaturated esters. These include diethyl 4 (3?) methyl-cyclohexane-1,1-dicarboxylate, diethyl 3,4-dimethyl-cyclohexane-1,1-dicarboxylate, diethyl bicyclo (2,2,1) heptane-2,2-dicarboxylate and diethyl 6-methyl-bicyclo (2,2,1) heptene-2,2-dicarboxylate.

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<sup>5</sup>Wightman, J. Chem. Soc., 2541 (1926).

<sup>6</sup>Bachman and Tanner, J. Org. Chem., 4, 493 (1939).

Spiro-Barbiturates

The synthesis of spiro barbituric acids from various cyclohex-3-ene and cyclohexane 1,1-dicarboxylates was investigated.

When magnesium methoxide was used as condensing agent, barbiturates were obtained from esters without substitution ortho to the carboxylate groups. Esters of this type were diethyl cyclohexane- and diethyl cyclohex-3-ene-1,1-dicarboxylates, diethyl 3,4-dimethyl-cyclohexane- and cyclohex-3-ene-1, 1-dicarboxylates, 4(3?)-methyl-cyclohex-3-ene-1,1-dicarboxylate and diethyl bicyclo(2,2,1)heptane-2,2-dicarboxylate.

The synthesis was unsuccessful when esters substituted by methyl ortho to the carboxylate groups were tried with magnesium methylate. However, one of these esters formed the barbiturate when dry sodium ethoxide was used as condensing agent.

Seven spiro barbituric acids were prepared. Six of these are new compounds.

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## THE LOW PRESSURE CATALYTIC HYDROGENOLYSIS OF ESTERS

John William Hodge, Thesis (Ph.D.)  
University of Missouri, 1942

The low pressure hydrogenolysis of esters was investigated in order to determine some types of structure for which such low pressure hydrogenolysis was possible. In this connection, several types of esters were studied.

The esters were prepared as follows:  
O-benzoyl lactonitrile was obtained by shaking equal quantities of acetaldehyde, and benzoyl chloride with an aqueous solution of potassium cyanide. The ester was obtained by extraction of the mixture with ether, and subsequent evaporation of the ether. O-acetyl lactonitrile was obtained by the acylation of acetaldehyde cyanohydrin with acetic anhydride by heating the mixture on the water bath for an hour, the ester being obtained from the reaction mixture by distillation. The ethyl-O-benzoyl-, and ethyl-O-acetyl- lactates were prepared by heating for three hours on a water bath equal quantities of ethyl lactate with benzoyl chloride, and with acetyl chloride respectively. The desired esters were recovered by distillation. Nitro hydroxy esters were prepared by esterification of the corresponding nitro alcohols. The primary alcohols were esterified with glacial acetic acid in the presence of a trace of concentrated sulphuric acid. Benzene was used to remove the water azeotropically. The secondary alcohols were esterified with acetic anhydride in the presence of a trace of concentrated sulphuric acid by heating the mixture for one hour at 60°. 2-nitro-1-ethanol was prepared by the condensation of paraformaldehyde with nitromethane in the ratio of 1:20

grams. A few fragments of potassium carbonate acted as condensing agent. 2-nitro-1-propanol was similarly prepared by the condensation of paraformaldehyde with nitroethane in the same ratio as above. 1-nitro-2-propanol was prepared by the condensation of 1.5 moles of nitromethane with 1.5 moles of acetaldehyde in 100 ml. of water. The alcohol was recovered by extraction of the reaction mixture with ether. In a like manner, were prepared, 3-nitro-2-butanol from acetaldehyde and nitroethane, 3-nitro-2-pentanol from acetaldehyde and 1-nitropropane, and 3-nitro-3-methyl-2-butanol from acetaldehyde and 2-nitropropane. 2-nitro-1-butanol, and 2-nitro-2-methyl-1-propanol were commercially available.

The hydrogenations were carried out in a Parr Hydrogenation apparatus using approximately 50 lbs./sq. in. hydrogen pressure. Raney Nickel catalyst was used in all reactions. The catalyst was activated by the usual procedure.

The reactions of O-benzoyl, and O-acetyl lactonitriles with hydrogen showed no evidence of reduction after 24 hours. Likewise, no hydrogenation or hydrogenolysis was noted in the reactions of ethyl-O-benzoyl-, and ethyl-O-acetyl- lactates after 24 hours. In 12 hours, 0.225 moles of 2-nitro-1-ethyl acetate gave a yield of 37 per cent of ethanolamine, 40 per cent yield of N-acetyl ethanolamine, and 20 per cent of ethylacetamide. 2-nitro-1-propyl acetate (0.191 moles) in 8 hours gave 64 per cent of diisopropyl amine and 35 per cent yield of isopropylacetamide. 1-nitro-2-propyl acetate (0.195 moles) in 17 hours gave 27 per cent of di-n-propyl amine, 29 per cent n-propylacetamide, some starting material, and residue which was not identified. 2-nitro-1-butyl acetate (0.171 moles) in 6 hours gave sec-butyl amine, 27 per cent of 2-amino-1-butanol, 30 per cent of N-acetyl-2-amino-1-butanol, and 22 per cent of sec-butylacetamide. 3-nitro-2-butyl acetate (0.186 moles) in 15.5 hours gave sec-butyl amine, 49 per cent of 3-amino-2-butanol, and 8 per cent of the N-acetyl derivative of the latter. 2-nitro-2-methyl-1-



propyl acetate (0.175 moles) in 10 hours gave *tert*-butyl amine and 23 per cent of its *N*-acetyl derivative. 3-nitro-2-pentyl acetate (0.153 moles) in 48 hours gave a 45 per cent yield of 3-amino-*n*-pentane, 38 per cent of 3-amino-2-pentanol, and 14 per cent of *N*-acetyl-3-amino-*n*-pentane. 3-nitro-3-methyl-2-butyl acetate (0.048 moles) gave in 5 hours, 63 per cent of 3-amino-3-methyl-*n*-butane, 19 per cent of the *N*-acetyl derivative, and 12 per cent of *N*-acetyl-3-amino-3-methyl-2-butanol.

In addition, a study was made of the rate of hydrogenation of the various nitro esters using 0.1 moles of each (except the two pentyl acetates where 0.05 moles were used).

Results indicate that carbethoxy, or nitrile groups are not sufficiently active to promote hydrogenolysis at low pressure without the help of other activating groups. The nitro group is sufficiently active. Among the nitro hydroxy esters, branching of the chain increases hydrogenolysis, a nitro group on a secondary carbon atom is more effective than one on a primary carbon atom, and the rate of hydrogenation decreases with increased molecular weight of the ester.

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## A STUDY OF THE WAX OF THE NELUMBO PENTAPETALA

Sister Agnes Marie Horner, Thesis (Ph.D.)  
Saint Louis University, 1939

The *Nelumbo pentapetala*, the most striking member of the Water Lily Family in Illinois, can also be found in slow streams and lakes from the Rocky Mountains eastward, south to the Gulf of Mexico, and north to Nova Scotia. It is perennial from a large rootstock which is buried in the mud.

Great leaves, from thirty to sixty centimeters broad and nearly orbicular in shape arise from the stock of the *Nelumbo* plant. The upper side of the leaves contains all their wax, which constitutes about one per cent of their weight. Because of their wax content the leaves are perfectly water resistant.

The study was made on the wax obtained from the leaves by extracting them with boiling ligroin and evaporating off the solvent. The method of separating the various components of the wax was based principally upon the solubility in different organic solvents, of the individual fractions and their derivatives.

The most interesting material extracted from the wax was the fraction which contained the dihyric alcohol,  $C_{28}H_{58}O_2$ , having a melting point of 105-106°C. It is this fraction which gives to the leaves their peculiar water-resisting property.

In addition to this alcohol, there was also obtained an acid fraction, melting at 75.3-76.7°C. There was evidence that this fraction consisted of n-fatty acids of the series  $C_{24}$  to  $C_{34}$  admixed with hydroxyacids of about the same chain length. Keto acids were not found.

A further product of the leaf wax was a secondary alcohol,  $C_{29}H_{58}O_2$ , melting at 91.3-93°C.



This was oxidized to the diketone,  $C_{29}H_{58}O_2$ , which melted at  $87.87.4^{\circ}C$ .

There was also a paraffin fraction melting at  $67.4-67.8^{\circ}C$ . Comparison of data obtained from this fraction with that on synthetic mixtures indicated that the chief component of the paraffin fraction was nonacosane,  $C_{29}H_{60}$ , with about five per cent of hentriacontane,  $C_{31}H_{64}$ , and smaller amounts of higher and lower homologues.

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A PHYSICO-CHEMICAL METHOD FOR THE DETERMINATION  
OF THE VITAMIN D POTENCY OF FISH OILS

Gerald Vaughan Kingsley, Thesis (Ph.D.)  
Michigan State College, 1942

A Physico-chemical Method for the Determination of the Vitamins D Potency of Fish Oils. D. T. Ewing and G. V. Kingsley, Chemistry Department, Michigan State College, and A. D. Emmett and R. A. Brown, Research Laboratories, Parke Davis and Company, Detroit, Michigan.

Studies have been directed toward developing a physico-chemical method for determining vitamins D in fish oils. The procedure here outlined has been applied with reasonable success to some fifty fish oils that have been assayed by the U.S.P. bio-method.

In the method proposed in this paper, vitamin A, carotenoids and pigments are removed by chromatographic adsorption of the nonsaponifiable fraction of the fish oil. The chromatographed solution, containing the vitamins D and sterols, is analyzed by use of a modified Brockmann and Chen antimony trichloride reaction. A second chromatographic adsorption treatment removes vitamins D and allows the interfering sterols to pass through the adsorbent. The sterols are then evaluated and the vitamins D potency of the oil obtained from the difference between the above analyses.

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## A STUDY OF MERCURY-OIL EMULSIONS

Amos L. Lingard, Thesis (Ph.D.)  
University of Kansas, 1940

Mercury-oil emulsions are unique in that they constitute an emulsion system in which water is not one of the components. Since the major part of our information on emulsions has been accumulated on systems of which water is a component and because of the very great difference in properties between mercury and water, a study of the preparation and properties of emulsions constituted of mercury and oil is of interest and value in the development of a general theory of emulsions. The term oil used in this study refers specifically to a hydrocarbon oil, a refined white (medicinal) mineral oil having a density at 30° C. of 0.8735 gm./cc.

In the absence of an emulsifying agent, no emulsification took place on shaking or stirring the two pure constituents together. Approximately thirty substances were tested as emulsifying agents by stirring mercury with oil containing a small amount of the added substance for a given period of time and then observing the appearance of the mixture on standing. Emulsions were also prepared by: (1) condensation of mercury vapor produced by an electric arc struck between two mercury electrodes immersed in the oil; (2) by heating mercury in a Pyrex flask and condensing the hot mercury vapor directly in the oil; and (3) by bubbling air through the lower (mercury) layer of the two constituents contained in a large test tube.

Interfacial tension measurements between mercury and pure oil and between mercury and oil containing various addition agents were made by the drop weight method. The viscosities of the oil and of

emulsions were measured by the time of flow from a calibrated pipette. Density and mercury content determinations were made for a series of emulsions. The size distribution of droplets in six emulsions containing different emulsifying agents was determined by examination under a microscope with the aid of an ocular micrometer and a haemocytometer. Emulsions were further investigated for presence of a charge on the droplets, for the determination of methods of breaking, and for the possibility of forming the oil-in-mercury type of emulsion as well as the mercury-in-oil type.

It was found that emulsions of mercury-in-oil can be prepared by the common mechanical and condensation methods of preparing emulsions, but in no instance was there any evidence that emulsions were formed in which oil was dispersed in mercury. The effect of several substances on the interfacial tension between oil and mercury and the emulsifying action of these substances are shown in the following table:

Added Substance	Conc.	Temp. °C.	Interfacial tension (dynes)	Emulsifying action
None		22	370	
Palmitic acid	0.8%	22	362	Good
Beeswax	0.8%	22	378	Good
Beeswax	0.4%	22	367	Good
Carnauba wax	0.4%	22	368	Good
Lanoline	1.0%	22	350	Good
Lanoline	2.0%	23	344	Good
Camphor	1.0%	22	369	Poor
o-cyclohexyl phenol	1.0%	22	350	Good
Cetyl alcohol	1.0%	22	367	Poor
Oleic acid	1.0%	23	352	Good
Gum myrrha	< 0.5%	23	368	Poor
Rosin	< 0.5%	23	342	Good



Those substances which produced an appreciable lowering of the interfacial tension between oil and mercury were also good emulsifying agents, but that some other factor is equally effective in bringing about emulsification is shown by the fact that two substances, namely, beeswax and carnauba wax, which did not lower the interfacial tension, were good emulsifying agents. It is probable that the high viscosity of the dispersion medium aided in bringing about emulsification in the latter two cases. The viscosities of a series of emulsions of increasing mercury concentration relative to that of the dispersion medium are shown in the following table:

Emulsion	Density gm./cc.	%Hg	Viscosity relative to dispersion medium
No. 1	0.8770	0.08	1.01
No. 2	.8771	0.23	1.01
No. 3	.8818	0.66	1.00
No. 4	.8913	1.73	1.00
No. 5	.9082	3.77	1.01
No. 6	.9273	5.75	1.01
No. 7	.9538	8.18	1.05
No. 8	.9863	11.27	1.10

The nature of the emulsifying agent was not important in determining the size distribution of droplets in emulsions prepared by stirring. The droplets ranged in diameters from less than one micron to about 35 microns. The average size of the droplets was approximately two microns. The dispersed droplets exhibited no electric charge; they cream rather rapidly but do not coalesce.

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## THE PYROLYSIS OF PROPANE

Stuart McLain, Thesis (Ph.D.)  
University of Michigan, 1932

The reactions of propane under heat were studied by passing propane through a quartz tube held at constant temperatures ranging from 582 to 796 degrees Centigrade. The gas was passed through a purifying train, volume meter and heated quartz reaction tube into either a collecting bottle for analysis or meter for measuring the change of volume. Temperature was measured by thermocouples moved in and out through a smaller diameter quartz tube which was placed concentric with the heated tube. Heating was carried out by electric coils placed outside a thick-walled  $Ka^2$  steel tube placed concentric with and outside of the quartz reaction tube. The furnace consisted of preheating and reaction sections. The products were analyzed by a Podbielniak low temperature fractional distillation apparatus and Orsat gas analysis apparatus.

Propane was chosen for study since it is an ideal member of the normal paraffin hydrocarbons and its carbon chain can be broken in only one way; i.e., next to one end carbon atom. Data obtained would be very valuable because of their theoretical importance in helping to explain the general phenomena associated with the subject of chemical kinetics. An investigation was undertaken to obtain information concerning the products of the pyrolysis under controlled conditions and at various reaction rates and temperatures.

Data were collected over a temperature range of 582 to 796 degrees Centigrade and with times of exposure of 1.92 to 6.05 seconds. The analyses of the products of the tests made were used to calculate constants in the Arrhenius equation:



$$k = Ae^{\frac{-\Delta H}{RT}}$$
$$= 1.1 \times 10^{11} e^{\frac{-52,000}{RT}}$$

Straight chain hydrocarbons with four and five carbon atoms were not identified in the products of analysis of any test. A very slight amount of tarry products and a negligible amount of carbon were formed during the reactions.

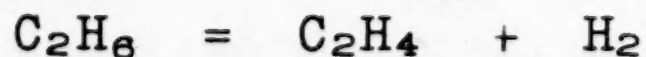
The gaseous products consisted of mixtures of the lower hydrocarbons and hydrogen. A plot of the data obtained as per cent of components in exit gas versus per cent of propane in the exit gas permitted an extrapolation to zero propane decomposed. Thus the initial components of the gas decomposition were obtained with the following results:

<u>Component</u>	<u>Per Cent</u>
Hydrogen	19
Methane	23
Ethylene	23
Ethane	12
Propylene	23

These results are in substantial agreement with the chain mechanism theories of F. O. Rice (J. Am. Chem. Soc., 53:1959 (1931)).

The theories of dehydrogenation for the pyrolysis of propane as advanced by F. O. Rice lead to results similar to those obtained in this investigation except that the ethane content of the gas as predicted by a chain mechanism is lower than found. This is probably due to the hydrogenation of the ethylene produced in the initial decomposition of the propane.

The equilibrium constants for the reaction



were calculated and it was shown that the data ob-

tained during the pyrolysis of propane were in good agreement with the free energy equation

$$\Delta F - 32,400 - 29.9T$$

as given for this hydrogenation by G. S. Parks and H. M. Huffman "Free Energies of Some Organic Compounds," Chemical Catalog Company, 1932. Since this is the only reaction found to be in equilibrium, the rate of the reaction must be high.

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THE CONDENSATION OF THE METHYL DIPROPYL CARBINOLS  
WITH PHENOL IN THE PRESENCE OF ALUMINUM CHLORIDE

Carl Ridge Meloy, Thesis (Ph.D.)  
Michigan State College, 1942

Methyl di-n-propyl carbinol was prepared by combining two moles of n-propyl magnesium bromide with one mole of ethyl acetate. The same Grignard reagent was used with equimolar quantities of methyl iso-propyl ketone in the preparation of methyl n-propyl iso-propyl carbinol, while the methyl di-iso-propyl carbinol was formed from methyl magnesium bromide and di-iso-propyl ketone. The carbinols were dried with anhydrous sodium sulfate and purified by fractional distillation under diminished pressure.

The condensations were carried out by dissolving pure crystalline phenol in the stirred carbinol and adding the anhydrous aluminum chloride in small portions. The molecular ratio of carbinol to phenol to aluminum chloride was 2:3:1. The reaction temperature was kept below 30°C. Stirring of the viscous mixture was continued for an hour after all of the aluminum chloride had been added.

After standing overnight the condensate was hydrolyzed with ice and 1:1 hydrochloric acid. The hydrolysate was extracted from the aqueous layer with ether. Drying of the ether solution was accomplished by the use of anhydrous sodium sulfate. This was followed by removal of the ether on the water bath. Using a pressure of 6 mm., the distillation gave three fractions: unreacted carbinol between 45 and 60°C., unchanged phenol up to 90°C., and the alkyl phenols above 120°C. Refractionation at 2 mm. pressure followed by recrystallization from petroleum ether served to purify the p-t-octyl phenols.

As derivatives the alpha-naphthyl urethanes were prepared by the use of alpha-naphthyl isocyanate and the 3,5-dinitrobenzoyl esters were made by using

3,5-dinitrobenzoyl chloride. These were all crystalline solids melting above 95°C.

In order to establish the structure of the alkyl phenols it was necessary to prepare the corresponding octylbenzenes. These were prepared by condensing the same three carbinols with benzene in the presence of aluminum chloride. Nitration of the octylbenzenes yielded p-nitro-t-octylbenzenes. This was established by oxidation in the Carius furnace, p-nitrobenzoic acid being the oxidation product. The nitro compounds were then reduced to p-t-octylanilines, diazotized to the corresponding diazonium salts, which were in turn converted to the p-t-octyl phenols.

The p-t-octyl phenols were all crystalline solids, colorless when pure, with melting points in the range of 55 to 75°C. They boiled above 275°C. at atmospheric pressure and showed a high solubility in water and all common organic solvents.

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## REACTIONS OF $\beta$ -ENYNE HYDROCARBONS

Chapin E. Stevens, Thesis (Ph.D.)  
University of Missouri, 1942

The catalytic reduction by hydrogen at atmospheric pressure and at 25-30°C. in the presence of Raney nickel catalyst of 1-nonen-4-yne, 2,2-dimethylhepten-6-yne-3, and 5-phenylpenten-1-yne-4 was investigated. 1-Nonen-4-yne was reduced to 1,4-nonadiene, b. p. (atm.) 146-148°C.,  $N_D^{20}$  1.4267,  $D_{20}^{20}$  0.748, by the absorption of one molar equivalent of hydrogen. The absorption of two molar equivalents of hydrogen by 1-nonen-4-yne yielded 4-nonene; complete reduction gave nonane. 2,2-Dimethylhepten-6-yne-3 was reduced to 2,2-dimethylheptadiene-3,6, b. p. (atm.) 130-135°C.,  $N_D^{20}$  1.4187,  $D_{20}^{20}$  0.742, by the absorption of one molar equivalent of hydrogen. The reduction of 2,2-dimethylhepten-6-yne-3 stopped with the absorption of two molar equivalents of hydrogen and the formation of 2,2-dimethylheptene-3. 5-Phenylpenten-1-yne-4 was reduced to a mixture of partial reduction products by the absorption of one molar equivalent of hydrogen. Absorption of two molar equivalents of hydrogen by 5-phenylpenten-1-yne-4 yielded only one product, 1-phenylpenten-1. 1-Phenylpentane was formed by the complete reduction of this compound under these conditions.

The addition of one molar equivalent of hydrogen to 5-phenylpenten-1-yne-4 at atmospheric pressure and at 25-30°C. in the presence of a catalyst of palladium deposited on calcium carbonate was selective. The partial reduction product was 1-phenylpentadiene-1,4, b. p. (atm.) 205-207°C.,  $N_D^{20}$  1.5342,  $D_{20}^{20}$  0.907. 1-Phenylpentadiene-1,4 rearranged in alkaline solution. 1-Phenylpentadiene-1,3 was shown to be the most probable structure of the rearrangement product.

2,2-Dimethylhepten-6-yne-3 was prepared by the condensation of 3,3-dimethylbutynylmagnesium bromide with allyl bromide in the presence of a catalyst

of cuprous chloride. The compound had the following constants: b. p. (atm.)  $125.5^{\circ}\text{C.}$ ,  $n_{\text{D}}^{20}$  1.4305,  $d_{20}^{20}$  0.758. 2,2-Dimethylhepten-6-yne-3 was hydrated in the presence of mercuric salts to 6,6-dimethylhepten-1-one-5, b. p. (14 mm)  $60-61^{\circ}\text{C.}$ ,  $n_{\text{D}}^{25}$  1.4280,  $d_{25}^{25}$  0.834, semicarbazone m. p.  $133.5-134.5^{\circ}\text{C.}$

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THE PREPARATION OF ALKYL AND ALKAMINE ESTERS OF  
P-AMINO CINNAMIC ACID

Louis Leon Sulya, Thesis (Ph.D.)  
Saint Louis University, 1939

The ethyl, n-propyl and n-butyl p-nitro cinnamates were prepared by the reaction of p-nitro cinnamoyl chloride and the appropriate alcohols. The resulting p-nitro cinnamates were reduced to the corresponding amino cinnamates with iron and HCl. The reaction between chloro-ethyl p-nitro cinnamate and secondary amines is not a feasible method for the preparation of alkamine p-nitro cinnamates. The latter can be best prepared from p-nitro cinnamoyl chloride and the appropriate amino alcohol. Reduction with iron and  $H_2O$  yields the p-amino cinnamates. The following alkamine p-amino cinnamates were prepared:

Diethylamino ethyl p-amino cinnamate  
Dipropylamino ethyl p-amino cinnamate  
Diallylamino ethyl p-amino cinnamate  
Dibutylamino ethyl p-amino cinnamate  
Piperidino ethyl p-amino cinnamate  
Alpha-methyl piperidino ethyl p-amino  
cinnamate.

Crystalline salts of the alkamine p-amino cinnamates could not be obtained with HCl,  $H_3PO_4$  or  $H_2SO_4$ . The alkamine esters were converted into borates, which, upon analysis, indicate that 5  $HBO_2$  are combined with one mol of free base. The diethylamino ethyl and alpha-methyl piperidino ethyl p-amino cinnamate borates alone are water soluble. Preliminary tests of anesthetic efficiency are being conducted on these compounds.

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## COMMUNICATIONS

### PHASES OF INTERNATIONAL LAW AFFECTING THE FLOW OF INTERNATIONAL NEWS COMMUNICATIONS

William Finley Swindler, Thesis (Ph.D.)  
University of Missouri, 1942

This is a general survey of the field of international law as it pertains to or affects the field of international news communications. Although newspapers and news agencies are private industries, they also operate as a matter of public convenience and necessity, and thus certain phases of public law--in this case public international law--relate to them and define their status as no other industry is defined.

To make this study, a preliminary discussion of the nature of public international law, together with a discussion of private international law as it is intermingled with the question, is conducted in Part One, the Introduction. This Part One is completed by a chapter on the development of the modern international news gathering industry.

Part Two describes how international law, public and private, relates to the business of entering foreign countries and establishing the right to gather news there. The status of alien newspapermen in peace and war is discussed.

Part Three takes up the problems involved in the transmitting of this news, once gathered, by the several media for international commercial communications--the telegraph and cable, the wireless, and the postal service. All of these are regulated by international convention and have special provisions relating to international news communications.

Part Four deals with the problems of protecting the international news en route to its proper destination. Copyright and other property rights as these have been applied to or discussed in connection with international news, are analysed in this Part.



Part Five considers the problems of propaganda and censorship, which present major obstacles to the business of gathering accurate news abroad, and have received some degree of consideration by makers of international law.

Part Six is a Summary.

The dissertation is concluded with a bibliography and a series of tables illustrating certain aspects of international news communications.

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## ECONOMICS

### ADMINISTRATIVE CONTROL OF STATE EXPENDITURES

John Tyler Caldwell, Thesis (Ph.D.)  
Princeton University, 1939

In 1938 twenty-one State governments in the United States--twenty of them after 1929--had adopted measures for controlling expenditures by administrative techniques. In abandoning their reliance upon legislative competence, the whole question of the nature of the expenditure authority was brought to the front.

Expenditure authority in the United States is founded upon constitutional requirements rooted in the long struggle between King and Parliament in England. A pivot of this struggle lay in control of the purse. In the twelfth century there were no limitations on the king's control over the expenditure of what were in fact his revenues. But by 1400 the foundations for two essentials of control of expenditures by a responsible authority had been indicated. First, the relatively new institution of Parliament had begun to attach conditions to the grants (which in 1340 assumed the character of an appropriation) to the King, and, second, it had gone so far as to check compliance by appointing ad hoc commissions of post-audit (1341) and of pre-audit (1377). During the period of Tudor absolutism the Parliament abdicated to a great degree its control of expenditures. Late in the reign of the first Stuarts the resurgence of responsible control was indicated in the sweeping conditions attached to a grant to James (1624), which included a pre-audit council. By 1694 Parliament was able to make an appropriation conditional upon the actual realization of sufficient revenue, on failure of which payment of each obligation of the crown was to be "proportional to" the revenues received. From



the beginning of the eighteenth century to the present the chief English developments have been the consolidation of funds, the emergence of the Treasury as a responsible administrative institution, and the establishment of a responsible accounting procedure.

The early constitutions of the United States reflected the established fact in England that appropriations must be made by the legislative branch of government before public money can be expended and that the auditor is accountable to the legislature for the lawful expenditure of funds. Historically these two requirements are supplemented by such additional rules and conditions as the appropriating authority chooses to lay down. Because American constitutions embody the principle of separation of powers, arrangements between legislature and executive for allowing executive discretion and for enforcing responsibility in the expenditure of public money have been more difficult than in England. An examination of the law, however, reveals that courts in the United States have generally allowed the legislatures to determine when the appropriation law is complete, the meager exceptions occurring only in deference to a formal requirement of a particular state constitution.

In providing for controls to avoid deficits, the orthodox concept that an appropriation is an authority to spend a specified amount necessarily gives way to the idea that the appropriation is only an initial plan of disbursement, conditional upon the existence of certain facts to be administratively determined. The authority to reduce expenditures in accordance with the demands of objectively determined conditions, varies considerably in type and amount. The authority to act is mandatory in some States (as in Kentucky) or permissive (as in Connecticut). The discretion as to what funds and how much they may be reduced is quite narrow in West Virginia, but in Ohio, for instance, the administrative discretion is unimpaired. The most common provision requires the reduction of each appropriation in the proportion that estimated revenues are not realized. In only six

States of the twenty-one do the controls extend to all funds.

Actual experience in the various administrative control devices to reduce expenditures has been scanty up to the date of this study. Few conclusions, therefore, are justified. It can be stated, however, that application of the controls had not escaped resistance, with resulting legislative and judicial entanglements.

In Mississippi, a State which has operated a deficit more years than not since 1900, the need for deficit control is great. It would appear that administrative controls could be established under the present expenditure process. Although more adequate machinery for formulating a sound budget is to be desired, administrative control itself would lend strength to the State's entire fiscal process.

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## THE OFFICE OF COUNT OF THE PRIVY PURSE IN THE LATE ROMAN EMPIRE

George R. Monks, Thesis (Ph.D.)  
University of Michigan, 1938

The study of the office of Count of the Privy Purse in the Late Roman Empire is important for various reasons; it was not a privy purse in any modern sense of the expression, but rather a public treasury on a par with the Sacrae Largitiones. Categories of property affecting every province of the Empire, so numerous and comprehensive as to make the Res Privata perhaps the dominant economic factor in certain areas, pertained to the Privy Purse. Public expenses, both regular and extraordinary were paid by the revenues of the Res Privata. A treatment of this office, therefore, constitutes a detailed study of an important phase of the financial administration of the Late Empire, and is thus, from one point of view, an inquiry into an important cause for the internal collapse of the ancient world. As a detailed investigation of a single office it is also a study of the bureaucracy which persisted as a principal element of the strength of the Byzantine Empire.

Part I undertakes to trace the history of the office from its origin until its disappearance early in the 7th century.

Part II is a detailed treatment of the administration of the Res Privata. The officium of the Count is first discussed, its various departments and grades of officials, the manner of their recruitment, their individual duties, advancement, immunities and privileges, etc. Next is considered the origin of the lands and revenues pertaining to the Privy Purse under nine categories, i.e.-- 1. bona proscriptorum vel damnatorum, 2. bona vacantia et caduca, 3. temple

property, 4. municipal estates, 5. property of heretics and pagans, 6. property of those contracting forbidden marriages and of those guilty of the spoliation of graves, 7. legacies, 8. miscellaneous confiscations, and 9. fines. It is evident that the revenues of the Res Privata were derived principally from landed property. A description of the process of incorporation of these properties ensues, together with a description of the legislation intended to prevent abuses in this connection. The locatio and exploitation of these lands occupies a separate chapter and includes a discussion of the various types of land tenure in vogue in the Late Empire as practiced on the domain lands, i.e.--tenure iure perpetuo, ius privatum salvo canone, and ius emphyteuticum. A separate chapter is also devoted to the tax levies, regular and extraordinary, to which the Res Privata was liable, the method of collecting the revenues in kind and specie, an account of the manner of selecting the collectors, the terms of their service, their authority, and the guarantees required of these functionaries, including also an account of the difficulties of collecting, especially from the potentiores, as well as a detailed consideration of the abuses and extortion to which the whole system lent itself and the vain attempts of the Emperors to check these abuses by repeated legislation, concluding with a particular account of the fiscal corruption and anarchy existing in the African diocese under Honorius. A chapter on the transport and storing of the taxes of the Res Privata follows. Next is considered the immunity of the Res Privata with an attempt to unravel the confused status of the Privy Purse in this respect at different periods in its history. The five ensuing chapters deal with special aspects of the competence of the Count of the Privy Purse. Three of these have to do with the maintenance of the armed forces of the Empire, i.e.--the recruitment of the army, the levy of horses and draft animals, and the fundi limitotrophii. The other two concern the care of certain of the Imperial palaces and other proper-



ties, and the Imperial manufacturies whose superintendence was entrusted to the Count, involving the production of the precious fabrics worn by the Court and the clothing of the army, although by far the greater amount of such manufactures were in the charge of the Count of the Sacred Largesses. This second part of the Dissertation concludes with two chapters, the first on the juridical competence of the Count of the Privy Purse and his subordinates and its fluctuations as they are reflected in the Imperial legislation, and the second a special consideration of the Res Privata and its relation to the petitores and delatores, its inevitable concomitants. Both of these chapters reveal the legal process of the Late Empire, its delays, corruption, venality, and abuses in spite of all attempts to secure a just and efficient administration.

Part III discusses in detail the titles, honors, and privileges of the Count of the Privy Purse and this aspect of the bureaucracy of the Late Roman Empire generally.

An Appendix contains a reconstruction of the Fasti of the Counts of the Privy Purse for both the Eastern and Western Empires as well as the Ostrogothic Kingdom.

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## EDUCATION

### JUNIOR COLLEGE PROVISIONS FOR ADULT EDUCATION

Burke W. Bradley, Thesis (Ph.D.)

University of Missouri, 1942

#### Purpose

To determine junior college provisions for adult education services.

#### Method of Research

A study was made of the offerings for adults in public and private junior colleges in the United States as published in their catalogs and as shown in their annual reports. Case studies were made of public junior college centers in Missouri by submitting a questionnaire, interviewing officials and teachers, examining State Department of Education records, and by collecting circulars and mimeographed materials.

#### Summary and Conclusions

1. Junior colleges, both public and private, have definitely entered the field of adult education.
2. In providing adult education services, junior colleges should offer credit, non-credit, or both credit and non-credit classes at convenient times in accordance with the interests and desires of the students.
3. The sponsoring of forums, lectures, concerts, dramatic productions, exhibits, and recreational activities indicates that the junior college administrators feel that these are worthy services and will accomplish educational purposes.
4. The extent of adult education activities and enrollments shows that adult education is a significant service of the junior college.
5. Radio provides a large audience that listens regularly and is a means of education of the people of the area served by the junior college.



6. Case studies of adult education in public junior college centers in Missouri reveal in detail what is being done and can be accomplished in various types of communities of different sizes.
7. Adult education as a service of the junior college has significant possibilities when the hundreds of thousands of potential students are taken into consideration.

### Suggestions

There is and will continue to be a greater need for adult education for the following reasons:

1. We must train millions of our youth and adults, both men and women, in skills essential to production in industry in our supreme war effort.
2. We must be prepared after the war to provide unusual opportunities for adults displaced in industry and for the millions of our armed forces, including the injured, who will need assistance in readjusting their lives.
3. We should provide to the limit of our resources for the education necessary to develop and maintain the loyalties, knowledges, and disciplines essential for free men in a democracy.

The system of free public education in the United States should include the education of adults because:

1. Adult education should be under the same leadership as other divisions of the school system.
2. Education is a process that continues through life.
3. A school center has facilities owned by the people that are not used, in the main, except for a few hours during the school day.
4. As so aptly stated by the Educational Policies Commission:<sup>1</sup>

.... the strengthening of loyalty, the defense of democracy, the sustaining of morale,

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<sup>1</sup>Educational Policies Commission, A War Policy for American Schools, 1942, pp. 27-28.

the promotion of an understanding of the war and its consequences and causes, and the winning of the peace, the audience of the teaching profession must include the adult population as well as children and youth.

5. The adults of the nation will increasingly demand opportunities for education. If the public schools do not meet their needs, then society will develop some other means to provide these services.

Adult education should continue to be an interest of the Federal Government and should be channeled:

1. Through the United States Office of Education;
2. Through state boards of education of the several states; and in turn
3. Through the boards of education of enlarged school districts.

The junior college is the logical unit for adult education because of a number of unique advantages:

1. Being the upper department of the school system, it is best equipped to meet this situation.
2. All of its facilities--plant, equipment, library, laboratories--are better adapted to the needs of adults than other divisions.
3. Its faculty members, trained to instruct older youth, can adapt their teaching methods most effectively to adult instruction.
4. It does not embarrass adults to attend classes sponsored by a college.
5. Courses already organized, especially those in terminal education, if not already suitable for adults, can with a minimum of revision form cores for adult curricula.
6. The junior college has already proven its ability to offer adult education services.

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AN ANALYSIS OF THE EXTENT TO WHICH PRACTICES  
RECOMMENDED IN BOOKS ON HIGH SCHOOL  
TEACHING METHODS ARE BASED ON  
PSYCHOLOGICAL PRINCIPLES

Claude Maurice Dillinger, Thesis (Ph.D.)  
University of Missouri, 1942

The main purpose of this study is to attempt to determine the extent to which the writers of widely used textbooks in methods of teaching for secondary schools have made and are making use of psychological principles in the teaching practices recommended. Other purposes are to determine to what extent important movements or trends in psychology are reflected in the recommended teaching practices, to examine the statements made by the authors regarding their psychological beliefs, and to determine whether there is a respectable body of psychological knowledge upon which teachers may rely and if this knowledge is of a nature such that it can be successfully translated into classroom practice.

It is believed that a study which can answer, at least in part, these questions is of value to educational psychologists in that it may stimulate efforts toward making psychology function in specific classroom practices, rather than only in broad outlines. The lists of recommended practices and psychological principles should have some value to students of teaching techniques. The writer knows of no study of a similar nature.

The study is limited to a consideration of actual teaching methods recommended in the textbooks selected for analysis. By methods are meant the practices followed in teaching by the teacher in the classroom or study room, or in direct and immediate preparation for the classroom or study room. The study is further limited by the fact that the study

is not experimental in nature, that the data do not lend themselves to statistical treatment, and that the collection and evaluation of the data have not been done in an entirely objective manner.

Two kinds of data were necessary for this study: (1) a list of the teaching practices recommended in the books selected for analysis, together with notations as to which books recommended which practices, and (2) a list of psychological principles, generalizations, and facts against which these recommended practices could be checked.

Questionnaires were sent to professors of secondary education in 74 state and private universities in the United States, asking them to indicate which textbooks in methods of high school teaching were, in their opinion, most widely used in six five-year periods from 1910 to 1939 inclusive. On the basis of the replies, 12 books were selected for analysis. A careful study and recheck of these 12 books resulted in the drawing up of a list of 398 recommended practices, grouped under nine headings.

The list of psychological principles and generalizations was developed by the investigator over a period of several years' study of psychology. The principles are based on courses taken under university professors of psychology, on textbooks in educational psychology, and on studies reported in psychological journals. These generalizations do not represent a consistent system of psychology, nor do they represent in every case the author's psychology. They do represent principles and generalizations stated by psychologists and educational psychologists.

Each practice in the list of 398 recommended practices was carefully checked against the list of psychological principles to determine whether the practice could be considered as being based on a psychological principle.

Subject to the limitations of the study, the following conclusions may be drawn: (1) a large percentage of recommended teaching practices are based on psychological principles and these practices



cover a large and essential body of teaching methods, (2) there is a large body of psychological knowledge upon which teachers may rely, but a considerable part of this knowledge is such that it functions only in broad outlines, (3) the recent books show little improvement over the older books, as far as statements on psychology and percentages of practices based on psychological principles are concerned, (4) there is little relation between important discoveries and trends in psychology and the recommended practices or psychological principles stated in the books, (5) there is considerable agreement among the authors of the books as to which psychological principles are of most importance, (6) the principle of self-activity (learning takes place only through activity on the part of the learner) is far the most important psychological principle, judging from the number of practices based on a principle.

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## DESCRIPTION AND PREDICTION OF PHYSICAL DEVELOPMENT IN SCHOOL BOYS

Marguerite F. Hall, Thesis (Ph.D.)  
University of Michigan, 1934

The solution of the problem of describing and predicting physical development in school boys in terms of the major factors which influence growth was undertaken in this study. The concepts selected from the literature in the field as the major factors which influence growth were: nature and nurture--the essential elements of growth; maximum at maturity, rate, incipency, time, and capacity--the generalized characteristics of all growth; quality, potency, and complexity--the factors differentiating growths.

The data were collected from 4,338 boys attending seven Detroit Public Schools from the kindergarten through the second semester of Grade XII. The chronological ages of these boys ranged from 60 through 246 months. The basic data included: (1) the measurements of height, weight, and chest circumference; (2) dental observations; (3) scores on tests of mental ability; and (4) copies of official school records of date of birth, intelligence rating, ability group, and semester in school. Supplementary data included records of successive measurements through a nine-year interval for a small number of boys from the Harvard Growth Study.<sup>1</sup>

The analytical work of the investigation was directed toward the achievement of two goals: (1) the utilization of the major factors which influence growth in the description of physical development of school boys, and (2) the verification of the

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<sup>1</sup>Records of individual boys were obtained through the courtesy of Dr. Psyche Cattell.



control of these factors through the method of prediction.

The steps used in the description of growth included: (1) sorting the data into age-groups of six-month intervals; (2) finding the central tendencies and variabilities of each physical measurement for each age-group; (3) analyzing the curves derived from the graphic representation of the mean values; (4) and expressing the curves as equations. The mean values were assumed to be the sequences of growth of the normal or average boy and described growth as taking place in time. The mathematical equations described the objective characteristics of these growth sequences in terms of specific values for the maximum at maturity, the rate, and the incipency for both the childhood and adolescent developments in height, weight, and permanent teeth. These equations failed to describe perfectly the average development of the 32 age-groups in terms of the generalized characteristics of growth.

Verification of the control of the major factors influencing growth was achieved through prediction. For purposes of prediction, 100 boys were selected from the total of 4,338 boys. The control of the age factor alone proved to be inadequate both for the total and for the selected groups. Evidence was then presented through height predictions for the selected boys that the adequacy of the predictions could be increased through refinement of method resulting from increasing control over the factors which influence growth. The number of perfect predictions for height increased from two when estimates were made with no knowledge of the factors except sex to twenty-three when predictions were made through the control of the factors in the description of height from development in weight.

Two hypotheses were formulated for the inadequate agreement of the data with prediction: (1) curves and equations derived from central tendencies of measurements of successive age-groups do not adequately describe the nature and course of the growth process. Curves of the mean heights of successive groups

of boys in grade-at-age failed to verify this hypothesis; but the composite curves and equations whose constants were the averages of the constants in the developmental equations for individual boys portrayed two-cycle growth better than did the curves of the means. (2) Adjustments can be made in the specific values of the constants in the basic height equation to meet individual differences in the growth factors described by these constants. To verify the second hypothesis, adjustments were made through the available information for each boy such as: developmental ratio, dental and weight quotients, build, and weight and girth indices. Adjustments proved to be inadequate for some boys but never for all boys. Failure to secure adequate adjustments may be due to any one or all of the following reasons:

- (1) Lack of information in the basic data concerning the time when adolescence begins.
- (2) Absence of knowledge of the relationships which may or may not exist between the constants in the equations.
- (3) Absence of knowledge of some measure for the capacity factor which determines maximum at maturity.
- (4) The unknown factor which determines the starting point of the different growth cycles.

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## THE HISTORY OF THE UNIVERSITY OF TOLEDO

Frank R. Hickerson, Thesis (Ph.D.)

University of Cincinnati, 1941

The chief motives of Jesup W. Scott in establishing the Toledo University of Arts and Trades were his desire to leave property to endow a great university, his belief that some day Toledo would be one of the largest cities in the Western Hemisphere, and the influence of his son, Frank, who had studied in a school of design in Paris and believed that a similar institution would thrive in Toledo. Scott had formerly been a teacher in a public elementary school, in an academy, and in a women's college. He was a close friend of Horace Mann for many years. Toledo was a booming city in 1872, and Scott's interest in an educational venture at that time is easy to explain.

Conditions seemed most favorable for establishing the Toledo University of Arts and Trades. Infant industries were springing up all over the city, and new railroads and a canal were pouring in the agricultural products of the West. Skilled mechanics and draftsmen were in great demand. The Toledo University of Arts and Trades was far from being a university. Painting and drawing were the only courses offered. Most of the students were women. The people of Toledo did not support the school with either enough students or money to make it a going concern, so it had to close its doors. If the school had been organized along the lines proposed by Scott, its history would certainly have been very different.

During the next period, 1884 to 1900, the city council accepted the Scott trust, and a municipal university was started. It had only one department, the Manual Training School. The work of this school corresponded to that of the industrial arts and home economics departments in the present-day high school. The plans of the directors were greatly

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<sup>1</sup>Published under subsidy from Hayes Memorial, Freemont, Ohio.

influenced by those of the Polytechnic School at Washington University in St. Louis. The directors, with rare foresight, organized an institution which, for many years, was regarded as the model manual training school in the United States. Eminent educators from all sections of the country visited it, in order to get ideas for establishing similar institutions in their own cities. The Manual Training School was operated in conjunction with Central High School and the same pupils were enrolled in both schools. All groups of citizens in Toledo were proud of the school and enthusiastically supported it.

The directors made two mistakes. The first was in expanding the program of studies to include manual training in the elementary schools of the city, and the second was the drawing up of a lease for the site of the Manual Training School on the Central High School grounds. The first resulted in a program which was too expensive to conduct with the limited resources of the school. The second resulted in several years of litigation with the board of education. This litigation antagonized many of the leading citizens of Toledo, and their opposition retarded the transition of the institution into a real university.

An attempt was made to secure an endowment for Toledo University in 1900. Contacts were made with Andrew Carnegie, and plans were presented by his representatives to the board of directors. After considerable wrangling over minor details, the offer was finally rejected. The following year Carnegie endowed the Carnegie Institute of Technology. With a little more foresight on the part of the directors, Toledo University might have taken the place of the latter institution. An attempt was made to merge the Toledo University with Otterbein College, but the trustees of that institution turned down the proposition.

In order to establish a real university, the directors affiliated the university with the Toledo Medical College and established a College of Pharmacy in 1904. Another reorganization was made in 1909



when William H. Raymond was chosen as the first President of the University. The College of Arts and Sciences was established and a faculty of four members chosen.

The University of Toledo is now recognized as one of the best organized among the fourteen municipal universities in the country. It has six colleges and a graduate department. There are approximately 100 full-time and 50 part-time instructors. Last year 3,745 students were enrolled. The university is now becoming the cultural and intellectual center of Toledo.

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THE HISTORY OF INSTRUCTION IN AMERICAN LITERATURE  
IN COLLEGES AND UNIVERSITIES OF THE  
UNITED STATES 1827-1939

John Smith Lewis, Jr., Thesis (Ph.D.)  
New York University, 1941

Little evidence of professional interest in American literature on the part of college authorities before 1870 can be adduced. Work in oratory included American materials, and under "belles-lettres" some American poetry was probably studied. Shaw's Outlines of English Literature with Tuckerman's Sketch of American Literature appeared as a standard reference book. Before 1870, Amherst (1827-1829), Middlebury (1848-1849), Heidelberg (1858-1859) mentioned American literature in catalogues. Retarding American literary studies in the colleges at this time were the prevailing educational philosophy--which regarded other than classical literature as unworthy of serious attention--meagerness of faculty, and prejudice against dealing with contemporary literature.

Between 1870 and 1890 American literature began to find a small place in the colleges. Richmond, Cornell, Illinois, Baylor, Haverford, Hobart, Mississippi, Iowa, Washington University, Princeton, Swarthmore, Union, Bates, Trinity (Connecticut), Tufts, Michigan, Kansas, North Carolina, Missouri, Antioch, Rochester, Franklin and Marshall, St. Lawrence, Minnesota mentioned American literature in courses, but only as a part of other courses as a rule. The work of Moses Coit Tyler at Michigan and of John S. Har at Princeton was important during this period. Behind the rising interest in American literature were the increasing wealth of the nation, operating through increasing enrollments, and changes in the type of college teacher. The centennial year 1876 turned attention to the nation's history. As a

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<sup>1</sup>Published under subsidy from Hayes Memorial, Freemont, Ohio.



retarding force, the study of philology, a result of extensive study in Germany by American scholars, began to dominate the English field.

In the years between 1890 and 1918 American literature became an established course in a majority of American institutions. This period saw the beginning of the work of modern authorities in American literature. Course descriptions reveal an increasing sense of background and a slight movement toward the sociological interpretation of American literature.

The period 1918-1938 was marked by a continuing increase in college courses in American literature. By the middle 'twenties the American novel, short story, and drama had emerged as new courses. Opportunities for graduate study in the American field increased greatly, and institutions began to show promise of becoming centers for advanced work. At Pennsylvania, Harvard, Yale, and New York University a curriculum leading to an advanced degree was offered in the field of American literature and related subjects. Milestones in the history of American literature in the colleges were: the founding of a separate department of American literature at Middlebury (1923-1924); the founding of American Literature at Duke University in 1929; the publication of Vernon Louis Parrington's Main Currents in American Thought in 1927 and 1930.

For 1938-1939 the following facts were noted: (1) State and national institutions were offering more work in American literature than were privately supported institutions; (2) no section of the nation was particularly prominent in the teaching of American literature; (3) the average time devoted to American literature in American colleges and universities was 11.6 semester hours, this representing 14.4 per cent of the total English-department offering in literature.

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## EDUCATIONAL OPPORTUNITIES IN MISSOURI PUBLIC AND NON-PUBLIC HIGH SCHOOLS

Charles Willard McLane, Thesis (Ph.D.)  
University of Missouri, 1942

This investigation compares the educational opportunities available in the public and non-public high schools of Missouri in terms of such objectively measurable factors as adequacy of plants, professional and subject-matter preparation of staff, and the programs of studies. The study is also concerned with the efforts of these schools to meet their responsibilities to the social order through a program of general education and to the optimum growth of pupils through differentiated offerings.

Four approaches are used in the study of this general problem. In order to promote understanding, the status of non-public secondary education in Missouri is briefly surveyed. A second approach compares the programs of studies in the public and non-public high schools of Kansas City and of Saint Louis. A third aspect of the study concerns the courses offered for credit in the non-public high schools of Missouri during the years 1937 to 1942. Major emphasis is placed upon the comparison of educational opportunities available to the individual pupils in sixteen communities having both a public and non-public high school, each of which is a fully accredited, co-educational, white, day school offering work in grades nine, ten, eleven, and twelve.

Data were obtained from the files of the Missouri State Department of Education, those of the State Committee of the North Central Association, and those of the Committee on Accredited Schools and Colleges of the University of Missouri. Sampling lists for determining the quality of library books and periodicals, the Cooperative Study form for



evaluation of school plants, and other checking lists were used in the visitation of the thirty-two selected schools.

Of the schools studied, the public high schools were found superior to the non-public schools in terms of adequacy of school plants including library and laboratory facilities, the professional and subject-matter preparation of teachers, the professional training and the amount of administrative experience of the principals, the total number of units of work offered for credit, and the amount of work offered in each of the various learning areas. The non-public high schools made marked progress during the years 1937-1942 toward meeting the Missouri recommendations for general integrating education. Some progress also was made toward a broader program of differentiating education. It appears probable, however, that graduates of many of these schools will have difficulty in meeting the Missouri standards for high school graduation, effective in 1944. Limitations of school plants, teaching staff, and the programs of studies of the non-public high schools restrict many of these schools to work in one field of fine or practical arts. Under such conditions these courses tend to become constants.

In the light of these findings it is proposed that the accreditation of non-public secondary schools can contribute to the best interests of American democracy and of the individual pupils enrolled by requiring these schools to offer opportunities for general and differentiating education commensurate with those in the public high schools accessible to their pupils.

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THE DOCTRINE OF THE SEPARATION OF POWERS WITH  
SPECIAL REFERENCE TO ITS APPLICATION TO THE  
DELEGATION OF LEGISLATIVE POWER TO  
EDUCATIONAL OFFICIALS

Blaine Blair Nolan, Thesis (Ph.D.)  
University of Missouri, 1942

Purpose

To determine the extent to which the doctrine of the separation of powers has been made an issue in the adjudication of legal controversies directly affecting education; and to discover the disposition the courts have made of such issue, resulting in the formulation of general principles.

Method of Research

The historical-legal method was used in the study. Reliance was placed upon works of political philosophers for fixing of philosophical concepts of separation. Federal and state constitutions were studied for evidences of the incorporation of the doctrine into the American system. An examination of the decisions of appellate courts was made for their adjudication of the question of unconstitutional delegation of legislative power whenever that question was put in issue by litigants.

Summary

1. The growth of the concept of government by law rather than by man was traced, culminating in the theory of Baron Montesquieu expressed in his Spirit of the Laws, published in 1748.

2. The fundamental Montesquian thesis that the preservation of liberty required that the three departments of power--the legislative, the executive, and the judicial--should be kept separate and distinct



was incorporated into the Constitution of the United States and of each of the states.

3. The separation of powers is made attainable through a system of checks and balances in each of the forty-nine constitutions which constitute the fundamental law of the American Union.

4. Having determined that the powers should be separated, the position of education as a function of the state and the particular responsibility of the legislative authority thereof is significant.

5. The rules of law governing the delegation of this legislative power to educational officials are found to be as follows:

(1) The legislature cannot delegate power to make a law, but it can make a law to become operative on the happening of a certain contingency or on the ascertainment of a certain fact.

(2) The legislature may not abdicate to others its essential legislative functions, but the constitution does not deny to the legislature the necessary resources of flexibility and practicality which will enable it to perform its functions in laying down policies and establishing standards while leaving to selected instrumentalities the making of subordinate rules within prescribed limits and the determination of facts to which the policy as declared by the legislature is to apply.

(3) It would be impracticable in many instances, without mediate agencies for the legislature to carry out the objects and purposes of the law.

(4) The legislature although it may not delegate legislative power, may declare its will or policy and devolve upon administrative officers the power and duty of working out the details and establishing administrative rules.

(5) The power of the legislature over education is plenary, that is, complete, and other provisions of the constitution calling for

separation of powers do not apply where the right to establish a system of free schools is involved.

#### Conclusions and Recommendations

1. In the preponderance of cases in which unconstitutional delegation of legislative power has been charged, the courts have ruled that there has been no illegal delegation, but rather the power to work out details of legislative policy.

2. Therefore, such delegation does not constitute a threat to liberty.

3. Education is a complex governmental agency and requires a highly specialized personnel to administer it.

4. The ends of liberty are served by an efficient public school system, which is possible only if the filling up of the details is left in the hands of those who are acquainted with local needs and the complex operations of public education.

5. The same principle may be made to apply by extension to the relation of educational boards to their employed, trained, and professionalized administrative personnel.

6. General controls should be left in the hands of the legislature, which represents the collective good judgment of the sovereign people.

7. The local electorate should be given increasingly greater powers to apply general legislation to local needs.

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## AN ANALYSIS OF THE MEANING OF AVERAGENESS IN A COLLEGE APTITUDE TESTING PROGRAM

Mildred Winn Saupe, Thesis (Ph.D.)  
University of Missouri, 1941

The investigation was an endeavor to determine the meaning of averageness in a college aptitude testing program. The scholastic accomplishments of University of Missouri students who had been graduated from Missouri high schools cooperating in the Missouri Statewide College Aptitude Testing Program were analyzed in terms of several factors: (1) The college in which the student was enrolled; (2) The sex of the student; (3) The size of the high school from which he had been graduated; (4) The occupation of the student's father; (5) The student's courses during his freshman year. Students whose test scores placed them in the middle 60 per cent of all Missouri high school seniors tested and who also ranked in the middle 60 per cent of their high school class were designated as "average" students. Average students were compared with superior students, those who ranked in the upper quintile on both test score and high school scholarship.

The data were secured from the files of the Missouri Statewide College Aptitude Testing Program. The test used was the Ohio State Psychological Examination, Form 18. The data consisted of test percentile rank, high school scholarship percentile rank, size of the high school, grades earned in the university, parent's occupation, college enrolled in, courses taken, and the sex, of each student. There were 1321 freshmen in the group investigated, 462 were average freshmen and 356 were superior freshmen.

The data were treated statistically, but only so far as seemed necessary to find a numerical representation of the groups studied. Classifications

were made on the basis of the factors listed above, including subdivisions using two factors simultaneously whenever such subdividing was practical. The number of cases, a measure of central tendency and a measure of dispersion of the scholarship indices based on grades earned in the university were reported for each subgroup of both the average students and the superior students as freshmen, and where the number of cases justified such treatment, of sophomores also.

Many students of the average range did not succeed in earning grades averaging as high as the minimum one for which full credit is allowed. Students of the average range of a college testing program, although average as high school seniors, were not the average students in the university. Average freshmen in the College of Agriculture earned a higher mean grade than did freshmen of the other colleges. The mean grades of the men and the women of the average range were the same. Average freshmen from the smallest schools earned higher mean grades than did graduates of larger schools. The differences were not large, but consistently were in favor of the freshmen from the smallest schools. Average freshmen whose fathers were professional men, or of occupations at the top of a scale representing several degrees of economic security and independence, earned lower mean grades than freshmen whose fathers were engaged in occupations lower down the scale. Average students were more successful in courses which are predominantly literary than in courses predominantly scientific.

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## INTERSCHOLASTIC CONTEST PRACTICES IN PUBLIC HIGH SCHOOLS IN MISSOURI

Lauren Andrew Van Dyke, Thesis (Ph.D.)  
University of Missouri, 1941

In this study practices in public high schools in Missouri for managing and participating in interscholastic contests are described and opinions expressed by school administrators and coaches on pertinent problems related to contests are summarized. The study seeks to answer the following specific questions:

1. What is the nature and extent of participation in interscholastic contests by public high schools in Missouri?
2. What is the nature and extent of pupil participation in interscholastic contest activities in these Missouri high schools?
3. How is pupil participation in interscholastic contests managed in these schools?
4. What are some of the problems and practices in administering interscholastic contest activities in Missouri public high schools?
5. What are the opinions of superintendents, high-school principals, and contest coaches on certain problems and effects resulting from participation in interscholastic contests?

The data for the study were obtained from 240 public high schools for white pupils in Missouri. These schools ranged in size from seven to 2615 pupils. The 240 schools submitting data represent 72.4 per cent of the 359 schools to whom information blanks were sent and 29.4 per cent of the 818 classified public white high schools in Missouri for the 1939-40

school year. Opinions on contest problems were obtained from 478 administrators and teachers in the 240 schools studied.

Data for the study were obtained by the following procedures: (1) questionnaires sent to local high schools, (2) personal interviews with administrator and teachers, (3) examination of annual reports of high schools to the State Superintendent of Public Schools, and (4) examination of bulletins issued by organizations and institutions sponsoring and controlling interscholastic contests.

The contests were classified under the following eight general headings for convenience in making the study and in organizing data: (1) athletics, (2) academic, (3) art, (4) literary, (5) music, (6) practical arts, (7) publication, and (8) speech and dramatics.

#### Nature and Extent of Participation by Schools

The study shows that the greatest emphasis on interscholastic competition was in the areas of athletics and music. Of forty-five specific types of contests reported by the 240 schools studied forty-two per cent were athletic and twenty-two per cent were music contests. Boys' and girls' basketball were emphasized most in terms of average numbers of contests per school per year.

The average number of contests per school for the 1939-40 school year was 32.9. Large high schools competed in more contests than small high schools. Contests which provide few opportunities for participation in out-of-school situations received greatest emphasis. Only in athletics were contests controlled by some state professional organization for a majority of schools competing. Most of the contests, however, were sponsored by some type of high-school association; state, district, or county. Competition in national contests was confined to the areas of music and speech.



### Nature and Extent of Pupil Participation

More pupils competed and practiced in athletic and music contests than in other types of contest activities. The average number of hours of out-of-school time used for practice in athletics was greater than the average number of hours of in-school time. This situation was reversed for all other types of contests.

### Management of Pupil Participation

Pupils were classified for contest participation by sex, by weight, and by ability. Classification by sex was used by all schools in athletics but only a few schools used age and weight. Few schools attempted to classify pupils for competition in other types of contests. Most of the schools studied required pupils to be passing in at least three subjects to be eligible for contest participation. Athletic competition was limited to pupils under twenty-one years of age by all schools and by about sixty per cent of the schools for other types of contests. Pupils were awarded letters, certificates, and medals for participating in contest activities. Letters were confined largely to athletic competition. Contest work in non-athletic activities was usually related to classwork in terms of the use of in-class time for practice. This was not true in athletics.

### Administrative Procedures and Problems

Superintendents were responsible for the administrative control of contests in a majority of the 240 schools studied. In large high schools, however, the high-school principal was responsible. Contest finances were most generally obtained from the high-school activity fund although boards of education assisted in financing some non-athletic contests. The highest average costs per contest were in athletics and music with football the most expensive single type of contest in which more than a few

schools competed. Only ten per cent of the schools carried any form of accident insurance on competitors.

With but few exceptions, coaches were regular members of the faculty. A few schools reported that coaches had been dismissed or demoted because of a poor contest record. In some types of competition coaches were given promotions for a winning record. Coaches teach slightly fewer classes and receive somewhat higher salaries than other teachers.

The longest trips to compete in contests were made for practical arts and music contests. Transportation was usually furnished by the school. The percentage of schools reporting that pressure had been brought on school administrators to compete in contests was high enough to indicate a serious public relations problem growing out of contests. Incidents of rowdiness were reported by forty-five per cent of the schools and thirteen per cent reported that interscholastic relations had been broken with another school at some time because of unpleasant incidents at contests.

#### Opinions on Effects and Problems

A majority of the 478 superintendents, high-school principals, and contest coaches expressing opinions believed that contests have a desirable effect on contestants. The minority disagreeing, however, was large. These respondents also believed that too many agencies sponsor contests and schools enter too many contests. It was their opinion that the advantages of contests far outweigh their disadvantages. It was the opinion of a majority of coaches and administrators that there is a need in Missouri for a central state agency to control all types of interscholastic contest participation.

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CATHOLIC INDIAN MISSIONARY INFLUENCE IN THE  
DEVELOPMENT OF CATHOLIC EDUCATION IN  
MONTANA, 1840-1903

Sister Mary Afra White, Thesis (Ph.D.)  
Saint Louis University, 1940

The purpose of this study is to investigate the extent of Catholic Indian missionary influence in the development of Catholic education in the state of Montana. The conclusions which have been reached are that Catholic education in Montana was furthered to such an extent that its development was beyond what commonly is achieved under usual pioneering conditions. The means through which the missionaries advanced their educational plan were:

- a. the organization of mission-contract schools for Indian children
- b. the securing of teachers from established religious institutes out of the state, and finally
- c. the opening of schools for white children and the promoting of such schools.

Missionaries, together with the Sisterhoods whose services they procured, were responsible for opening or directing six mission schools for Indians. Save in one instance, separate boarding schools were conducted for the boys and girls. For the management of these institutions the Jesuits were guided in general by the Paraguay Reduction Plan, which could not be followed in detail because of existing physical conditions in Montana, dearth of man-power, lack of finances, and the influence of secularism.

Tangible results of this missionary activity among the Indians were not particularly noteworthy. Yet this very activity laid the foundation for Catholic education in Montana--provided the physical equip

ment, led to the organization of a curriculum, and secured the services of teachers who were destined to carry on the work begun by the Indian missionaries.

A noteworthy influence of missionary activity was the introduction into Montana of religious orders whose members had already served their apprenticeship and had acquired educational experience invaluable for their future work in Montana. Had the missionaries attempted to found local communities of religious teachers instead of drawing on older organizations, Montana's Catholic educational system would have been retarded, or at least would not have shared to so marked a degree in contemporary educational developments. The three pioneer religious communities of women who came to Montana at the invitation of the missionaries were responsible for the establishment of four academies. The first parochial schools were organized by diocesan priests who came to the state in response to the appeal of the Jesuit Superior of the Rocky Mountain Missions. Through these institutions, private and parochial, evolved the present Catholic educational system in the state with schools of elementary, secondary, and collegiate level.

The predominating missionary influence was that exercised by the Society of Jesus. However, the word missionary has been used to indicate any ecclesiastic or religious who came to Montana during the pioneering period, prompted by a desire to Christianize pagans, or to convert non-Catholics, as well as to safeguard the faith of Catholics within the region.

The limits of this study lie between 1840 and 1903. The year 1840 marks the beginning of organized missionary activity in Montana, which came to an end in 1903 when the state was divided into two dioceses.

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## ELECTRICAL ENGINEERING

### CURRENT DISTORTION IN THE END-RINGS OF SQUIRREL-CAGE INDUCTION MOTORS

Richard John Walter Koopman, Thesis (Ph.D.)  
University of Missouri, 1942

This dissertation describes a study of the distortion of the current distribution caused by skin or proximity effects in the end-rings of squirrel-cage induction motors, and its effect on the resistance ratio of the end-rings.

An idealized distribution of the magnetic fields producing the flux linkages that cause current distortion is assumed, and an expression for the current density at a point in the ring is obtained in terms of Bessel functions. By means of the expression for current density, a formula for the resistance ratio for the end-rings is derived. The resistance ratios of copper end-rings of cylindrical and disk shape of several sizes placed at several distances from the rotor core are compared with those obtained experimentally on a 7 1/2-horse-power, 4-pole, 220/440-volt induction motor, and quite close agreement is found over a range of frequencies from 25 to 66 cycles.

The rotor resistance was obtained experimentally by measuring blocked-rotor torque from which total rotor loss was obtained. The rotor resistance was then calculated by making use of measured electrical quantities on the stator and carefully calculated and measured parameters for the induction-motor equivalent circuit. The difference between this value and all other determinable rotor-circuit resistances was taken as the resistance of the end-rings. The resistance ratio is the ratio between this resistance and the apparent resistance at zero frequency.

The resistance ratios found experimentally at 60 cycles per second ranged from 1.16 for a disk end-ring placed next to the rotor core, through 1.22 for a wide cylindrical ring, and up to 1.63 for a disk ring placed 2 1/2 inches away from the rotor core.

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## GEOLOGY

### THE STRATIGRAPHY OF THE WESTERN HALF OF THE FULTON QUADRANGLE

Trusten Edwin Peery, Thesis (Ph.D.)  
University of Missouri, 1940

Few localities in Missouri present as complete a succession of formations as a belt of land in the central part of the state just north of the Missouri River. The need for a detailed study of the stratigraphic succession and correlation of these formations led the writer to investigate a representative portion of that area in southern Callaway County.

The geological section through this region is composed almost entirely of sedimentary rocks of the Ordovician, Devonian, Mississippian, and Pennsylvanian periods. The geological map accompanying the complete manuscript shows the areal distribution of the formations. No Mesozoic or Tertiary is present, but much of the area is mantled with glacial drift and loess, and many of the stream valleys are filled with recent alluvium. Well drillings show the presence of lower Ordovician and Cambrian formations, but none of these is exposed north of the Missouri River.

The structure of the region is relatively simple. In general the rocks dip gently to the north, and with the exception of one small anticline in the northern part of the area and a few broad undulating folds, no irregularities of consequence occur. Two distinct periods of deformation are apparent. The beds of the Jefferson City formation are in a series of small folds upon whose beveled surface the younger formations commonly lie with slight angular unconformity. The folding must have taken place in pre-Devonian time. The general tilt to the north and the folding found in the formations overlying the Jefferson City probably occurred in connection with

## GENERALIZED STRATIGRAPHIC SECTION

Era	Period	Formation	Character	Thickness in feet	
Cenozoic	Quaternary		Drift, alluvium, loess		
	Pennsylvanian	Henrietta (Ft. Scott)	Gray to buff nodular limestone with shale between upper and lower members	0-31	
		Cherokee	Shale and sandstone with fireclay, coal, limestone and conglomerate	0-57	
	Mississippian	Burlington	Coarsely crystalline white to brown crinoidal limestone with interbedded chert	0-73	
		Chouteau	Dense blue-gray to brown limestone	0-25	
		Bushberg	White to brown calcareous sandstone	0-3	
	Paleozoic	Devonian	Snyder Creek	Variegated calcareous shale with limestone at the top	10-35
			Callaway	Dense medium-gray to light-brown limestone in well-defined beds	5-53
			Mineola	Dense brown to coarsely crystalline white lime- stone	0-12
		Ordovician	Plattin (?)	Dense smoke-gray lime- stone with interbedded sandstone	0-6
St. Peter			White quartz sandstone	0-140	
Jefferson City			Dense light-gray to buff dolomite with interbedded lenses of sandstone, shale, and chert	140±	



the uplift of the Ozark dome on whose northern flank the area lies.

The mineral production is limited to coal, building stone, and fireclay. The coal is a poor quality bituminous and is found in only one bed, ranging between six inches and three feet in thickness. Fireclay occurs commonly beneath the coal, and this, in turn, is underlain in some places by flint clay.

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PLEISTOCENE GLACIAL DEPOSITS AND PREGLACIAL  
DRAINAGE PATTERN OF NORTHWESTERN MISSOURI

Raymond Maxwell Trowbridge, Thesis (Ph.D.)  
University of Missouri, 1938

The study of the Pleistocene Glacial Deposits and Preglacial Drainage Pattern of Northwestern Missouri, which was made in connection with an investigation of groundwater supplies, disclose many new features concerning the drift deposits of that area and supplied data which was used in determining the courses of the main preglacial streams across that portion of the state. The data for this dissertation was obtained from well logs, test holes drilled in the glacial deposits, and from a study of drift and bed rock exposures in road cuts, gravel pits, and along the walls of stream valleys. The area covered in this dissertation and the approximate southern limit of the drift in northwestern Missouri is shown on an outline map of Missouri.

The glacial drift phases as found in northwestern Missouri are surficial soils, gumbotil, oxidized and leached glacial till, oxidized and unleached till, and unoxidized and unleached till. Each of the different drift phases are discussed in the light of core drill work and field observations made from a study of outcrops along stream valleys and in fresh road cuts.

Stratified glacial deposits of silt, sand, and gravel are associated with the till and constitute an important part of the drift in northwestern Missouri. In places where these deposits are accessible and of sufficient size they are worked and the material used in buildings and for making roads. These deposits are submorainic and intermorainic and were probably formed as kames, valley trains, outwash plains, and deltas. A study of these stratified deposits revealed that thick intermorainic deposits



of sand and gravel separating two beds of till should not be used alone for assigning the till above to one glacial epoch and that below to another.

The glacial drift in northwestern Missouri has previously been classified as Kansan and Nebraskan in age. This classification was based chiefly on a study of gumbotil deposits in road cuts and along valley walls. In this dissertation an attempt is made to show that such gumbotil deposits may be formed by leaching action of groundwater at different stages during the cutting of the stream valleys, and since these gumbotil deposits do not extend horizontally into the drift back appreciably from the surface slope of the hill or valley well, as revealed by core drill work, they cannot be used as proof of weathering during interglacial stages. After a detailed study of the drift in northwestern Missouri, the writer believes that the drift of that area was deposited during one glacial stage and that this drift should be called the Kansan.

In connection with the investigation of fresh-water supplies from sand and gravel in and at the base of the glacial drift in northwestern Missouri two large preglacial valleys have been outlined from studies of outcrops, well logs, and test holes. One of these large preglacial valleys entered Missouri at the site of Kansas City and continued eastward following approximately the present valley of the Missouri River to Malta Bend, Saline County. At Malta Bend the preglacial river that flowed in this ancient valley probably crossed Saline County through the site of Marshall to Lamine River near the town of Blackwater, Cooper County, where it united with the preglacial river from the north and followed the present course of the Missouri River to the east.

The other main preglacial valley of northwestern Missouri probably entered the State in the northwestern corner of Atchison County and followed approximately the present course of the Missouri River to the vicinity of Mound City, Holt County, and from there trended northeastward to the south edge of Maryville, Nodaway County, where it turned southeastward

and roughly paralleled the present valley of Grand River from Gentry County to the southeastern part of Carroll County, thence southeastward along the present course of the Missouri River. A test hole at the south edge of Maryville and water wells at the convent near Clyde, at Stanberry, and at Albany prove its position in southeastern Nodaway County and in Gentry County. From Maryville to the northwestern corner of Atchison County no definite proof of the exact location of this preglacial valley has yet been established although a number of test holes were drilled in an attempt to do so.

This large preglacial valley received an important tributary from the north in southeastern Livingston County, one from the west in northwestern Daviess County, and another from the north in Holt County.

A map outlining the courses of the two main preglacial valleys and important tributary valleys accompanies this dissertation.

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## HISTORY

### THE HELGOLAND-ZANZIBAR TREATY OF 1890

Paul Edgar Hubbell, Thesis (Ph.D.)  
University of Michigan, 1937

This study is designed to give a full account of the Anglo-German colonial agreement of July 1, 1890. It deals with the history of Helgoland, the partition of East Africa, the diplomatic alignment of European powers, the negotiation of the Treaty and its reception in the German Reichstag.

The sources used include treaties and other international agreements, published correspondence--official and private--parliamentary debates and publications of the British and German Governments, periodicals and newspaper materials.

The island of Helgoland was long a base for blockade and smuggling. England had occupied it in 1807. The French navy's use of anchorage beyond the three-mile limit in 1870 made German patriots eager to annex it. In 1884 Bismarck attempted to gain this lofty island outpost as evidence of Britain's good will. The English Admiralty realized that the Whitehead torpedo greatly reduced Helgoland's strategic value.

Zanzibar was the base for scientific exploration, foreign missions and colonial enterprise. British interests of Livingstone's day competed with German merchants and seekers after colonies there, in East Africa and around Witu. In 1886 the Sultan submitted to an Anglo-German delimitation--and partition--of his continental possessions. Two years later Lord Salisbury collaborated with Bismarck in blockading the coast in order to suppress the slave trade and crush the Arab Rebellion which threatened the German protectorate and leaseholds on the mainland.

To protect British African interests, which Henry M. Stanley charged he was betraying, Salisbury

supported the MacKinnon Treaty. This advanced the Belgian King's Congo claims to the Nile and gave the British East Africa Company sovereignty over a narrow avenue between Lake Tanganyika and Lake Albert Edward, leading from the south into Equatoria. This lease of Congo territory provoked the Emperor and appeared as a device for blocking German expansion westward across the Upper Nile. England must give up her north-south connection, or Germany her road to the Congo.

On May 13 the English Premier offered Helgoland in order to reach a settlement in Africa. Thus he averted a break with Berlin which he had feared since Bismarck's fall. William II eagerly accepted the proposal and sacrificed claims to Uganda, the western basin of the Nile, Witu and Zanzibar itself, while making concessions for English trade from north to south across German colonial territory. Salisbury's desire for delay increased Berlin's insistence on the exchange.

Over the abandonment of Zanzibar German colonial enthusiasts became increasingly bitter. Although the Emperor and Count Caprivi had modified German African policy and abandoned Bismarck's use of European hegemony to press England into cooperation in colonial matters, yet they had gained full sovereignty from the Sultan over 400 miles of the East African coastline at the moderate price of one million dollars.

The documents do not support the English legend that "Helgoland was ceded to win Germany's friendship." Salisbury offered it to preserve peace and maintain British interests in Africa, especially access to the Nile sources, object of Stanley's Emin Pasha Expedition and heart of the German dream of great African Empire.

The Helgoland annexation was welcomed by the German public, press and parties for patriotic reasons. This Frisian island became a new Imperial war haven and--with the partially complete Kiel Canal--strengthened German national defense against attack by France and Russia. It also increased the navy's striking power in the North Sea.



Caprivi desired English friendship and secured maritime support overseas by this treaty, which was also warmly welcomed by the press of Vienna and Rome. The Chancellor, however, postponed renewal of the Russian Reinsurance Treaty in order to gain Helgoland and, while he was negotiating with the friendly Unionist Cabinet of London, the Tsar made the first advance to the French Republic.

Helgoland's defensive value in 1914 has confirmed the judgment of Caprivi and William II in preferring it to Zanzibar, but Karl Peters and other colonial critics founded the Pan-German League, implacable foe of British imperialism. Although approved by Parliament the cession remained unpopular despite the decreased value of Helgoland, more than nine times nearer Schleswig than Britain, and the distrust of Prussianism manifested by the Gladstonian Liberals seemed prophetic of future war.

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THE ANTI-CLERICAL ACTIVITIES OF THE FORTY-EIGHTERS  
IN WISCONSIN 1848-1860  
A STUDY IN GERMAN-AMERICAN LIBERALISM

Sister M. Hedwigis Overmoehle, Thesis (Ph.D.)  
Saint Louis University, 1941

The Forty-eighters were German Liberals who pursued the two-fold objective of giving the German cultural nationality its political unity and of replacing the German bureaucratic monarchy with a republican form of government. The national upheaval of 1848-1849, which marked the climax and failure of German revolutionary Republicanism, reduced thousands of liberal nationalists to political refugees, national exiles, or prisoners of state.

German political refugees to America considered themselves, at first, only temporary exiles. Consequently, they immediately solicited the assistance of their countrymen and the intervention of the United States in behalf of a German Republic. When this plan failed, they sought to impose their European program of revolutionary reforms upon our country. Colonization societies planned to found in the German states in the Midwest as asylums for political refugees or as German cultural units. Attempts were made to unite the Germans for concerted action in American public life. This process of "Germanizing" America was known as the movement of the "Sturum und Drang" of Germans in America.

The purpose of this dissertation is to trace the religious phase of the German reform program. As philosophical Liberals, Forty-eighters were avowed enemies of the Church and of religion. Their anticlericalism was therefore directed towards the exclusion of the Church from public life, and religion from the hearts of their countrymen. Wisconsin, the most Germanized state in the Midwest with the largest



Forty-eighter population, forms the geographical center for this study which is presented against the background of the general German reform movement. The anti-clerical activities are traced from the newspapers, journals, diaries, and other writings of Forty-eighters extant in the libraries in the Midwest.

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## THE JACOBAN OATH OF ALLEGIANCE AND ENGLISH CATHOLICS

Clarence James Ryan, S.J., Thesis (Ph.D.)  
Saint Louis University, 1941

In 1606 the English parliament, at the instigation of King James I and some of his Councillors, embodied in a penal statute an oath of allegiance which was to be administered to all Catholic citizens. Recalcitrants were to be punished with life imprisonment and the loss of all property and all civil rights. In two briefs Pope Paul V condemned the oath and forbade Catholics to take it on the ground that it contained many things contrary to faith and salvation. Archpriest Blackwell, head of the Catholics in England, under governmental pressure reversed his original stand and submitted. All of the regular clergy, with one questionable exception, refused to conform; of the secular clergy, only a handful capitulated. The latter group wrote extensively in support of the lawfulness of the oath, exhorting Catholic subjects to ignore the papal pronouncement and accept it. The question precipitated a controversy which spread throughout Europe and blazed at white heat for well over a decade.

Such treatments of the subject of this dissertation as have hitherto appeared are incidental, incomplete and usually distorted, i.e., either one of two impressions, both of which are shown to be false, is generally given: little attempt was made to enforce the oath legislation, or, the English Catholics submitted without much show of opposition.

Microfilm copies of important manuscripts housed in the British Museum were obtained shortly before these treasures were buried for the duration of the present European conflict. Research in these



and masses of other documents, many of which have been printed within the past two decades, has enabled the author to clarify another detail on the vast canvas portraying the cavalcade of Catholicism in England.

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HISTORY, AMERICAN

THE LIQUOR TRAFFIC AMONG THE ABORIGINES OF THE  
NEW NORTHWEST 1800-1860

Joseph Peter Donnelly, S.J., Thesis (Ph.D.)  
Saint Louis University, 1940

Few aboriginal groups, within the geographical limits of the present United States, gave such promise of effecting an easy transition from a state of nomadic culture to that of Western civilization as did those Indians inhabiting the territory west of the Rocky Mountains and north of the present state of California. The first whites who met these tribes found them possessing high moral standards and correct religious notions. For the most part, all of the civilizing and Christianizing influences which were brought to bear upon those Indians were American in origin. Further, when our national government extended jurisdiction to the Oregon country, there had been already formulated a humanitarian Indian policy, designed to educate the aborigines in America to a better life. Despite these fortuitous circumstances, after sixty years of contact with higher civilization, the Indians of the new Northwest were more degraded than before their meeting with the whites.

It is the purpose of this dissertation to show the influence of the liquor traffic on the aborigines of the Oregon country during the first sixty years of their relations with the white race. Though missionaries labored heroically to prevent the importation of liquor, and though federal legislation prohibited its sale to the Indians, spirituous liquor flowed into the country, debauched the Indians and left them prey to the greed of unscrupulous whites.

Through research in the National Archives, in the deposits of papers referring to the fur-trade and to the activities of missionaries, it has been



possible to present a clearer history of the first six decades of inter-racial relations in the new Northwest. Not the fur-trader, but the immigrant is to be held responsible for the injustice done to the Indians. Americans seeking homes in the Oregon country brought with them the conviction that the aborigines must be exterminated so that the whites might possess the land.

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## HORTICULTURE

### ANATOMICAL DEVELOPMENT OF THE SKIN OF POMACEOUS FRUITS WITH SPECIAL REFERENCE TO SPRAY RESIDUE REMOVAL

Seth Thomas Shaw, Thesis (Ph.D.)  
University of Missouri, 1940

The developmental anatomy of the skin of Jonathan, Rome, and Winesap apples and Bartlett pear were studied from flowering till fruit maturity to determine if any skin characters of the fruits may be associated with the ability of that fruit to retain spray residue (lead and arsenate). The fruit material was collected from two orchards near Provo, Utah. Trees in both orchards received the same spray schedule consisting of a calyx spray and six cover sprays at approximately 10-day intervals. Lead arsenate was used at the rate of three pounds per 100 gallons of water, and in the first two cover sprays one per cent of oil was included. The lead deposit in terms of grains per lb. of fruit and grains per square centimeter of surface was determined.

The samples for spray residue study were collected twice weekly from June 30th to July 22nd, then weekly until August 18th and by-weekly until September 14th, and at about weekly intervals from petal fall, and for histologic study at about weekly intervals from April 28th to September 14th.

Micro-measurements of the cells of the surface tissues were made at intervals of two to three weeks. Usual histological methods of preserving, dehydrating, clearing, and embedding in paraffin were used. The material was stained with safranin, gentian violet, light green, and orange G. Four specimens of each variety from every sampling were embedded and serial sections were cut and mounted in balsam. Drawings and microphotographs are presented to



show the stages in the development of the skin and skin structures of these fruits.

The results show that Jonathan, Rome Beauty, and Winesap apples retained spray residue during the growing season quite similarly. However, the Winesap apples were consistently higher than the Jonathans in lead deposit on each sampling date. The lead residue of harvested fruit, after washing, was considerably higher in the case of the Winesap variety.

An account by approximately ten-day intervals is given of the development of the skin of the above fruits. During the pre-blossom period the epidermis was well defined, but no other differentiation had occurred in the flesh except in the vascular bundles. The full-bloom period was characterized by the differentiation of the hypodermis and the formation of stomata. The hypodermis arose from the periclinal division of the outer 2 or 3 layers of the cortex. A marked radial alignment of the cortical cells was observed about ten days following full-bloom. It was caused by the extreme rate of periclinal division in the cortex following fertilization and fruit-setting. The radial cell pattern very soon disappeared.

The stomata continued to form for only 2 or 3 weeks after flowering. The lenticels were initiated principally from the stomata. They were small and widely separated on the apple but more numerous and larger on the Bartlett pear. Many pear lenticels late in the season were closed with cork or with a heavily suberized hypodermis. While the cells surrounding the mature apple lenticel were heavily suberized, the numerous intercellular spaces gave it an "open" appearance. No cork was formed in the apple lenticels and its development was rare in other areas. The cuticle was probably deposited at a more or less uniform rate, but the thickness of this layer increased more rapidly early in the season.

The hypodermal regions of the apple fruit were made up of the average of 5, 6, and 7 layers of cells for Jonathan, Rome Beauty, and Winesap varieties respectively. This layer was poorly defined in

the Bartlett pear, showing little wall thickening. The epidermal layer determined very largely the surface features of the cuticle. The cells of the epidermis became more triangular in the Winesap and Bartlett and in many places became completely separated. The cuticle filled in the spaces between them.

The skin characters studied, which are no doubt related to spray residue removal, are (1) amount of cuticle produced and (2) the surface features of this layer. The Winesap variety produced far more cuticle and more irregular surface features than apples of the Rome Beauty and Jonathan varieties. The surface of the cuticle on the Bartlett pear was very irregular but comparatively little cuticle was formed.

The inability of the epidermal layer to keep pace with the internal growth rate in the Winesap apple and its effect upon the surface features of the cuticle, together with the amount of cuticle produced, seem to be important factors in spray residue removal of this variety.

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## LANGUAGES, LATIN

### A STUDY OF THE LATINITY OF NARRATIO RESTAURATIONIS ABBATIAE SANCTI MARTINI TORNACENSIS

by Hermann of Tournai

Richard Eugene Arnold, S.J., Thesis (Ph.D.)

Saint Louis University, 1936

The basis of this study is the non-conformity of vocabulary and syntax of the Narratio with classical usage. As the norm in determining classical usage of words, Harper's Latin Dictionary was used; the basic norm for the syntax was William Gardner Hale and Carl Darling Buck, A Latin Grammar.

The classified listing of words is determined by their omission from Harper's, by the omission of the meanings of certain words used by Hermann, and by the limitation by Harper's of certain words and meanings to authors living and writing after 380 A.D. Harper's dates for the authors are followed. New words (79), new meanings (154), and non-classical words (176) are the respective headings of classification. Data from various other lexica complete those given from Harper's. The choice of 380 A.D. was not entirely arbitrary, since it was at this time that the facts and forces appeared which gave the initial appreciable impetus to the evolution of Latin into what we call Mediaeval Latin.

In the section on syntax, information from Hale and Buck is supplemented by noteworthy points from other more detailed grammars. The judgment of the findings according to Hale and Buck suffered very little alteration in the examination of these latter grammars. Since there is little to be gained from the sifting and listing of peculiar constructions and semel dicta in an author of Hermann's importance, it is the aim of the study "to judge the Narratio in the light of ordinary, not peculiar, Latin usage."

After the parts on vocabulary and syntax is placed a short and summary treatment of Hermann's

style in order to offset the unfavorable judgment likely to be prompted by the preceding listings of non-classical elements, and to give some basis for a positive criticism.

The vocabulary portion of the study is intended as a part of the contribution of Saint Louis University to the preparation of a revised Du Cange, Glossarium Mediae et Infimae Latinitatis, under the supervision of the Central Committee of the Union Academique Internationale.

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SANCTI AELREDI DE SPIRITALI AMICITIA LIBRI TRES:  
INTRODUCTION, TEXT, TRANSLATION, AND COMMENTARY

Sister Mary Eugenia Laker, Thesis (Ph.D.)  
Saint Louis University, 1941

Although the De Spiritali Amicitia has been translated into German and French, it has not previously been found in English translation. And so the purpose of this study is to present the treatise with introduction, translation, and commentary.

In the Introduction there is a brief account of the author's life and work together with an evaluation of the same; in addition, there is a discussion of the De Spiritali Amicitia as to texts employed, date and occasion of writing, form, content, value, and sources, with a few notes on friendship in the Cistercian tradition.

The text of the present edition is substantially that of J. P. Migne in the Patrologia Latina, vol. 195, columns 695-702. We have compared the Migne edition with that of the Maxima Bibliotheca Veterum Patrum, and we have made such changes as seemed necessary or advisable for a clearer understanding of the text. Where the Scriptural passages as quoted by Aelred differ from those in the Vulgate, the latter reading is given in full in the notes of the Commentary; in addition, references to Scripture not noted or incorrectly assigned in the Migne text are indicated in the notes. Changes in spelling and punctuation have also been made to secure uniformity in the text.

The Translation tends, on the whole, to follow the Latin as closely as English idiom permits. The Commentary includes all references to Scripture and other literary works; citations of Scriptural passages as indicated above; citations of parallel passages from Saint Ambrose and the works of classical

authors; indications of deviations, if any, from classical usage; comments on content, rhetoric, and style. There are two Appendices, one of parallel passages from Cicero and Saint Aelred, and the other of the stylistic features of the author's work.

Saint Aelred of Rievaulx, the "Bernard of the North" merits to become better known to the cultural world. He was a many-sided personality, an intensely human saint who could walk at the side of a king with as much ease as he could beside the lowliest lay-brother, and yet be loved by both alike. In the Cistercian tradition of friendship Abbot Aelred has shown how it is possible for a noble human friendship to wax into a Christ friendship, and conversely how from the latter, from Divine friendship, new life and endless beauty can be drawn upon human friendship.

As a writer Saint Aelred's unique position is "due in part to the limpid sincerity with which he laid bare, in his wish to help others, the growth and progress of his own mind and heart from the human to the divine, and in part to the candid humanism of his most characteristic pages." The Latinity of the De Spirituali Amicitia is essentially classical, reminiscent, too, of that of the Doctor Mellifluus. Its content is from beginning to end replete with Christian thought and feeling.

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## LITERATURE

### THE DECLINE OF TRAGEDY IN THE EARLY NINETEENTH CENTURY

George E. Grauel, Thesis (Ph.D.)

Saint Louis University, 1938

The lack of significant drama, particularly of great tragedy, in the early nineteenth century, is a commonplace fact of English literary history. This lacuna is partly explainable by conditions in the theatres: bad architecture, coarseness of the audience, conditions of management, the star system, and the theatrical monopoly. Upon investigation, however, it becomes obvious that these reasons provide only an incomplete solution of the problem.

The deeper causes of the debility of the drama are discoverable in the background of the age. A confrontation of three elements--the philosophic background, the plays actually written, and a scholastic theory of tragedy--reveals that the most serious and significant influence in the failure of tragedy between 1800 and 1850 lies in the mentality of the times. This mentality is found to be a concentration on natural, material values that is fundamentally prohibitive of great tragedy.

A close examination of the thought, the tragic theory, and the extant tragedies of Richard Henry (Hengist) Horne (1803-1884) reveals in him and his work qualities healthily discordant with the mentality of his times and in harmony with the essentials of great tragedy. His work is found to be, not high tragedy, but highly suggestive of what nineteenth-century tragedy might have been.

The significant relationship between the scholastic interpretation of the universe and the production of high tragedy is not an idea that is original with the present work. With that general idea as a basis, however, this study proceeds to a demonstra-

tion of its validity in a specific literary age, in particular conditions, confronting it with a definite field of facts. Briefly, the theory is here tested by fact; and from the test it emerges confirmed.

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A REINTERPRETATION OF THE ROMAN DE LA ROSE:  
A STUDY IN CHAUCERIAN BACKGROUND

Alan Murray Finlay Gunn, Thesis (Ph.D.)  
Princeton University, 1938

Few literary works have been credited with the influence and intrinsic importance attributed to the Roman de la Rose. From the Renaissance to the twentieth century, critics and literary historians have spoken with one voice concerning the primacy and the seminal nature of the thirteenth century allegory begun by Guillaume de Lorris and completed by Jean de Meun. Yet the critical examinations of the composition thus acclaimed have been surprisingly few. The notes and commentaries in the editions of Méon and Langlois; M. Langlois' study of sources; and summaries and generalizations offered by various literary historians from Paulin Paris to E. Faral and C. S. Lewis comprise almost the total of the significant work devoted to the allegory. Furthermore, these studies have been concerned chiefly with the poem's origins and its influence upon later literature, hardly at all with its significatio and structure. Perhaps as a result of this paucity of direct analysis, the traditional and still prevalent view has been that the Roman de la Rose--especially the part composed by Jean de Meun--is lacking in unity of theme and of design. Commentator after commentator has described the completed allegory as "less an art of love than a series of digressions, presented without plan and without proportion."

The present study of the poem--the first complete examination to be made of its subject matter and structure--refutes completely such an unfavorable view, vindicates the constructive genius of Guillaume de Lorris and Jean de Meun. The purpose of both poets, analysis of the text makes clear, was to set forth the

theory and the art of love, to make of it a "Mirouer aus Amoureux." Descriptions of the allegory by Christine de Pisan, Mario Equicola, Baïf, Pasquier and others show that this purpose was fully recognized by readers during the centuries of its greatest popularity. To such readers, the aim of Guillaume and Jean was enseignement--not, as certain moderns would have it, in optics, astrology, or alchemy, or in the wisdom contained in anciens livres--but in the theory and art of love.

Since the Roman de la Rose is primarily a medium of enseignement, an expository treatise, it follows that both the allegorical narrative of the dreamer's quest and the extended and often non-allegorical discourses are instrumental to the poets' expolitio of the theme of love. Viewed thus, the apparent interruptions of the narrative by the discourses are variations in expository technique, not lapses in structural skill. Nor are the two methods of exposition discrete, unrelated. The allegorical narrative represents the progress of a lover toward the fulfillment of his desires, during which quest he receives instruction in the meaning and art of love in the form of extended discourses from such personages as Amors, Raison, Amis, and La Vieille. Their counsels are of a sharply divergent nature--so much so as to make of the whole series of discourses a sort of disputation or debate. Of an extraordinary complexity in internal structure because of the poets' use for expository purposes of the devices of amplification recommended by medieval rhetoricians, yet in its basic scheme the completed allegory is as simple and as well unified as a primitive folk tale, as sophisticated as a modern problem play or novel.

Concerning the significatio of love in the completed allegory, it is perhaps most prudent to declare that it is viewed primarily as a subject for debate, as a problem upon which divergent views are possible and perhaps equally legitimate. Yet it is clear that Jean de Meun put chief emphasis upon that variety of love which has for its aim generation, or, in words suggested by Professor A. O. Lovejoy, re-



plenishment of the ranks in the Scale of Being depleted by Death. Nor, in thus representing love as the subject of controversy or in viewing it as the necessary agency for the maintenance of the race, was the poet opposing the currents of his age: he was rather revealing their divergencies and sharp conflicts, bringing to the light the hidden tensions between the chivalric, ascetic, and naturalistic schools of medieval thought.

Furthermore, by thus making explicit these divergencies, by thus shaping them into a grand and yet natural debate among the counsellors of Guillaume's youthful lover concerning the course he should follow to achieve entelechy or success in love, Jean de Meun was strengthening and defining the structure of the whole allegory. Not even the dual authorship of the poem, it will be observed, lessens this unity in structure, for the poet who completed the work was able to make the chivalric allegory of Guillaume de Lorris an integral and necessary part of his own more comprehensive expolitio of love's meaning and love's progress.

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LITERATURE, AMERICAN

CENSURE OF MAJORITY RULE AS A THEME IN AMERICAN  
LITERATURE 1787-1853

Robert Goyer Walker, Thesis (Ph.D.)  
University of Michigan, 1942

The purpose of this dissertation is to trace the ramifications in literature of a peculiar dilemma of the American democratic faith--the contradictory belief that popular sovereignty is essential to liberty but that there must be checks against this sovereignty in order to protect minority rights. At the founding of our federal government such Federalists as Hamilton, Madison, and Adams opposed majority rule on the ground that the propertyless majority would seize the property of the superior minority. To prevent this, a government of checks and balances was set up. Although censure of the majority principle resulted also from conflicting sectional interests, this dissertation treats only criticisms arising from conflict between economic and social classes.

The standard Federalist arguments--that majority rule endangers not only property but all human rights, that it produces demagogues, anarchy, civil war, and tyranny--appeared in the verse satire of the Connecticut Wits and T. G. Fessenden. Joseph Dennie also made frequent use of them in his newspaper, The Portfolio, particularly in defending the independence of the judiciary. But the best literary expression of the Federalist arguments occurs in Irving's History of New York and Salmagundi. Brackenridge made a more sympathetic criticism of the democratic majority in Modern Chivalry, pleading for the election of competent men to office, defending balanced government, and warning against demagogues, but also ridiculing a property qualification for suffrage.



Between 1820 and 1830, Webster, Kent, and Upshur led the conservative defense of property representation in the state governments. Here the old Federalist pattern of ideas appears again, with slight modifications. Webster's eulogy of property as a civilizing and liberating force and Upshur's assertion that there are no basic principles of government seem worthy of notice.

After the triumph of the majority in the election of Jackson, censure of majority rule was less bold than formerly. Whigs like Kennedy, author of Quodlibet, a satirical novel, and like the author of Whigs and Democrats, a play, made use of Federalist ideas to attack the Jacksonian Democrats but did not openly question the democratic form of government. Poe, however, made an extreme and vitriolic attack on democracy in Mellonta Tauta.

Cooper criticized the American majority on cultural as well as economic grounds. In The Monikins, Homeward Bound, Home As Found, and The American Democrat he objected to the levelling and conformity demanded by the majority. In his anti-rent trilogy he warned of the danger to property under absolute majority rule. In The Ways of the Hour he showed how a vulgar and tyrannical public opinion had vitiated trial by jury.

Emerson and Thoreau made a transcendental criticism of majority rule--that it enslaved the individual to public opinion and to government and blinded him to the inner light which was the source of all morality. Orestes Brownson in his magazine articles used the traditional American anti-majority argument, adding to it the necessity of the spiritual and temporal authority of the Catholic Church to preserve freedom.

This study tends to reveal a clear, fairly uniform pattern of censure of majority rule in American Literature before the Civil War. It appeared generally in literature of inferior quality. It was inspired by economic and cultural motives. Insofar as the critics of majority rule reminded Americans

that democracy requires operation of majority rule with respect for minority rights, they performed a valuable service. But insofar as they transformed minority rights into minority rule by an anti-social interpretation of these rights and by a defense of balanced government, they have contributed to the impeding of democracy in America.

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## LITERATURE, ENGLISH

### SPENSER AND THE EMBLEM WRITERS

Sister Mary Louise Beutner, Thesis (Ph.D.)  
Saint Louis University, 1941

This study has a two-fold purpose. First, it is an investigation of the relationship between Spenser's Faerie Queene and the Emblem-book genre, which was so popular during the Renaissance. As such, it is a continuation of the investigation begun in Volume I of the same title (Spenser and the Emblem Writers. Unpublished Master's thesis, Department of English, Saint Louis University, 1933), in which the minor poems of Spenser were examined in the light of this relation ship. It is not a source study, but rather an inquiry into the method and content of Spenser's poem in the light of the Emblem-books. One of the aims of the study therefore is to show that Spenser wrote in what is termed the "Emblem-book frame of mind." The second purpose is to provide a resumé of Emblem-book material in what might serve as a handbook.

Part I gives a resumé of the definitions of emblems and Emblem-books. Spenser's knowledge of this genre has been established in Volume I. But further substantiation is found in his interest in and close association with writers and works in the genre, cited herein. The current taste for emblems outside of Emblem-books is examined, and the prevalence of emblem ornamentation substantiates the thesis advanced in this study.

Part II is devoted to citing passages from the Emblem-books and passages of The Faerie Queene, that are considered analogous. The earliest translations, the Iconologies, "The Visions Literature," and the works of all the better known Emblematisers, are surveyed, and an attempt is made to give a cursory picture of them and their works. It is felt that the citing of parallel passages demonstrates Spenser's

"Emblem-book frame of mind," as well as his superiority as an artist.

The Appendix is devoted to passages from the Emblem-books which have parallels in The Faerie Queene. A check list of Emblem-books in the Folger and the Huntington Collections is also included. Since the collections of Emblem-books are rather inaccessible, this section of the study may serve as a handbook.

The emblem collections at the Newberry Library, Chicago; The Huntington Library, San Marino; The Folger Shakespeare Library; The Library of Congress, Washington; and the New York Public Library, New York City, have been used for this study. In addition to these collections, the copies of the Emblem-books at the University of Chicago, University of California at Los Angeles, University of California, University of Wisconsin, Brown University, and Columbia University have been examined.

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## PHILOSOPHY

### THE BACONIAN MIND IN EARLY NINETEENTH CENTURY AMERICA

Bernard Baum, Thesis (Ph.D.)  
University of Michigan, 1942

Evidence is presented to support the thesis that Baconianism, involving the idea of progress together with scientific and sentimental naturalism, had already begun to dominate American thought in the first half of the nineteenth century. At the same time the Baconian Weltanschauung itself is analyzed: its nature and rationale considered and its limitations indicated.

Following a summary consideration of the zeal being manifested by Americans in the cause of science and technology, the dissertation presents evidence of a pervasive optimism and naturalism found in periodicals, occasional addresses, and more permanent works produced between 1815 and the early 1840's. First noted and discussed is the assumption that man's physical, intellectual and moral progress is contingent upon the advancement of science and the useful arts. Here it is also demonstrated that both religion and the spirit of nationalism reinforced faith in the inevitable melioration of society. Then discussed is a concomitant of this faith in progress: the conviction that earlier cultures were inferior in all significant respects to the civilization being reared by modern man. It is then pointed out that the Baconian was already looking to science for the means of social advance not only because science offered power over the physical world but because it also seemed to promise power over man himself. Thus, it is shown, Baconians in America were already placing spirit itself completely within nature and the scope of scientific method.

The second part of the dissertation is devoted to an examination of the impact of Baconianism upon education during the same period. Here examined is the presence and influence of the belief that education could be rendered an instrument of progress if it were reduced to scientific principles and also

directed towards utility and the mastery of the sciences. It is observed that prominent and active educators were stimulated by the idea that from such an education would emerge men and women with intellects expanded and spirits elevated--men and women promising greater empire over physical creation and greater power for good over the human race. The sentimentalism that informed the views of Baconian educators is also noted in this part of the discussion. The consideration of the Baconian influence in pedagogy closes with a discussion of the conflict which resulted from the assault upon the old foundations of human culture in the linguistic and philosophical disciplines. Here is pointed out the presence of the utilitarian spirit that has tended to separate literature from life--to make of literature no more than a superficial form of amusement and to deprive life of the influence of the wisdom and beauty to be found in the great creative works of all times.

The concluding section of the dissertation takes up individually four figures of the period whose thought is representative of the Baconian attitudes previously treated. These are Edward Everett, who expressed ardent faith in science and the useful arts as the means of creating the brave new world; Horace Mann, who was a leader in the movement to apply Baconian tenets to pedagogy; Timothy Flint, who combined scientific and sentimental naturalism in his attitude; and Bronson Alcott, who, mingling naturalism with mysticism, reveals the influence of Baconianism upon that idealism which has been so persistent a strain in American thought.

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## THE CONCRETE UNIVERSAL AS A LOGICAL PRINCIPLE

Wm. Vander Lugt, Thesis (Ph.D.)  
University of Michigan, 1932

The thesis attempts to do two things. It seeks to set forth what is meant by the principle of the concrete universal and, secondly, it maintains that this principle has guided the whole development of philosophy. We find it, for example, in Plato, in Aristotle, in the scholastics, in Spinoza, in Kant, in Hegel, in Green, in Bradley, in Bosanquet, in so far as these men realized that this world is a coherent world which is to be interpreted in terms of value and not in terms of mere existence. The contention throughout is that idealistic logic is grounded in experience and that it will ultimately resolve itself into the concrete universal. It defends the concreteness of all universals on the following grounds:

(1) The immediate and the mediate are phases, not levels of experience.

(2) The individual is the true type of universality and is explicable only in terms of universals.

(3) The whole nature of the individual is embodied in the universal, and therefore the universal is capable of determining its individualistic characteristics.

A chapter is devoted to each point.

The doctrine of the absolute gives a reasonable account of experience since it postulates the existence of Reality within the realm of human thought. To prove this point, it seemed necessary to trace the development of thought from Pure Being to the Absolute. The thought process from the undifferentiated to the differentiated is continuous. Once admit that there is a "given," one is led to affirm the Absolute. Since there is no ultimate difference between the mediate and the immediate, thought is not necessarily abstract.

Knowledge is organic and because it is organic it is circular. It is from immediacy to mediation and back to immediacy. Knowledge cannot be compared to a house where the mediated knowledge is the superstructure and the unmediated the foundation. One cannot speak of precision without introducing quantity; quantity presupposes a unit, a standard, and where we have a standard we are dependent upon a system of knowledge. It is impossible to deny the organic nature of knowledge.

The second chapter contains the argument for identity-in-difference. The concrete universal is a cosmos or world where each member, although distinct, nevertheless contributes to the unity of the whole in virtue of the peculiarities which constitute its distinctness. The best example of it, according to Bosanquet, is a proper name, e.g., Caesar. Here we have an identity extended through space and time and in every judgment we make concerning Caesar we exhibit this identity in some act or moment through which it persisted. The self, therefore, is a concrete universal. It retains its identity in spite of its differences.

The chapter continues by attempting to show that recurrent and continuant types of universals are fundamentally one and the same. This does not mean that there is no difference between the two but rather that both are instances of an ultimate principle.

The last chapter considers the concreteness of the universal by showing that it determines its own individual embodiment. The universal must have instances and it must have just those instances that are. If it must have just those instances that are then there is no separate realm of subsistence. Essence and existence are related in such a way that a complete knowledge of essence involves the existence of all particulars. Nevertheless, whatever is here and now has a finality independent of any connection it may have with other things. We must not confuse quantity of information with the quality of truthfulness.

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## PHOTOGRAPHY

### THE INFLUENCE OF PRESSURE ON THE FORMATION OF THE LATENT PHOTOGRAPHIC IMAGE, PARTICULARLY ITS EFFECT ON REVERSAL IN THE REGION OF SOLARIZATION

Karl A. Maring, S.J., Thesis (Ph.D.)  
Saint Louis University, 1932

It was found that pressure applied to a photographic material during the course of exposure greatly retarded the formation of the latent image. On development, reductions in diffuse densities of a pressure area, from the diffuse densities of an area identically exposed and developed, but not under pressure, amounted to as much as 50 per cent. Holding the exposure constant and increasing the pressure increased the diminution in density, while, on the other hand, the effect diminished but never entirely disappeared, with increasing exposure, except where prolonged exposure produced reversal in the region of solarization. The proportionality is not linear however in either case. On excessively prolonged exposure, the effect, instead of diminishing further, became more and more pronounced. In fact the percentage difference became greater than at any other time during the course of the exposures. It is thought that this effect calls attention again to a theory of the latent image formation which is not popular with the scientists of today but was once strenuously defended by such eminent workers in this field as Hurter and Driffield, that is, the theory of the photomechanical disintegration of the silver halide crystals in the photographic emulsion. Both the effect of the pressure in the region of increasing densities and, especially, the phenomenon observed in the region of solarization are well explained by the hypothesis that the luminous radiation effects a shattering of the silver halide grain into a developable form, which shattering is restrained by the pressure; while in the region of solarization we have a recoalescence

of the grains into a form resisting the action of developers, which process we might expect to be aided by the applied pressures. Certainly the observed phenomenon appears difficult of explanation by any of the theories of solarization except perhaps by the pure latent image theory, based on the regression in size of sensitivity nuclei through the recombination of silver and bromine, as was proposed by A. P. H. Trivelly. Even this latter theory seems less apt an explanation than the photomechanical theory advocated by Hurter and Driffield and lately defended by F. E. Poindexter.

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## POLITICAL SCIENCE

### THE IMPLEMENTATION OF THE MONROE DOCTRINE

Melvin Henry Arthur Laatsch, Thesis (Ph.D.)  
Princeton University, 1942

This thesis presents a description and evaluation of the principles and practices of the Good Neighbor policy of the United States in an effort to prove that a policy of cooperative action among the American Republics is the strongest assurance of their security from external aggression and the best guarantee for the internal peace of the Americas.

Following Chapter I, which presents an appraisal of the evolution of inter-American cooperation and concludes that the Latin American policy of the United States since 1933 has brought about a solidarity of feeling that has made possible continental action in time of crisis, are three historical chapters. Because in any discussion of the relations of the United States with the other American Republics the Monroe Doctrine must of necessity occupy the primary place these chapters concern (1) the Monroe Message; (2) the growth of the Message into Doctrine during the nineteenth century; (3) and the imperialistic interpretations of the Doctrine that caused suspicion and fear of the United States in Latin American countries.

Beginning in 1928-1930 there can be traced a steady and progressive development of cooperation among the American Republics due primarily to a change in attitude on the part of the United States. (Chapter V.) President Franklin D. Roosevelt has emphasized and has been instrumental in developing this policy. He has differed from his predecessors in that he has matched noble sentiments with concrete acts.

The policies and practices of the United States at the last six Pan American Conferences

(Montevideo, 1933; Buenos Aires, 1936; Lima, 1938; Panama, 1939; Habana, 1940; Rio de Janeiro, 1942) are described and evaluated in Chapters VI and VIII. By accepting the principle that no state has the right to intervene in the internal or external affairs of another in 1933, the United States removed the greatest single obstacle to continental solidarity and the way was prepared for the united front that was later attained at the Panama, Habana and Rio de Janeiro Meetings of Foreign Ministers.

In Chapters V, VI, VII, and VIII the instrumentalities used in achieving inter-American cooperation are analyzed and appraised. These are (1) the International Conferences of American States; (2) the permanent secretariat of these conferences: the Pan American Union; (3) the Consultative Meetings of the Ministers of Foreign Affairs necessitated by threats to hemisphere security; (4) the special technical and administrative organizations created to solve common political, economic and defense problems caused by these threats; (5) and the various procedures for the maintenance of internal peace in the Americas.

Because, in the long run, the success of political and military cooperation depends upon the effectiveness of economic cooperation, Chapter IX appraises the economic relations of the American Republics. Their land, people and natural resources are described, the effect of World War II upon their domestic economies analyzed, and a long term program for continental solidarity presented. This program calls for (1) the development of rubber and natural resources; (2) the purchase in Latin America of numerous products previously purchased elsewhere by the United States; (3) the investment of capital for the development and diversification of industry in Latin America; (4) the establishment of an Inter-American Bank; (5) the improvement of transportation facilities by land, sea and air; (6) and raising the standard of living in Latin America. These suggestions follow those recommended at the Habana Meeting in 1940.



With the historic foundations of American security being successively challenged, the American Republics, under the leadership of the United States, have sought to build up other means of hemisphere security. (Chapter X.) In spite of the many political and economic factors that tend to differentiate them, the twenty-one American Republics are all interested in and determined to maintain their independence. Because of the exposed geographical positions, non-industrial economies and lack of military preparedness of the Latin American Republics, their defense will fall primarily upon the military strength of the United States. The conclusion follows that the biggest contribution that these countries can make to the war effort of the United States will be political and economic and not military. This chapter describes the various steps (those of which public announcement has been made) taken by the United States to strengthen the defense of the hemisphere.

Throughout the study an effort is made to correlate the developments in the Western Hemisphere with world events. Tribute is paid to the diplomacy of President Roosevelt, Cordell Hull and Sumner Welles.

One hundred and eighteen years have passed since the United States, unilaterally, declared the Monroe Doctrine. The process by which the principles of this doctrine have become the joint concern of the twenty-one American Republics is described step by step and the significance of the development evaluated. Today the non-intervention and non-colonization principles of the Monroe Doctrine are recognized and safeguarded in inter-American agreements.

The American Republics have professed their faith in the conduct of international relations as characterized by the Good Neighbor policy. No higher plane of international relations can be conceived than one based on fair play, equity, mutual trust and cooperation. The experience of the American Republics demonstrates that it is possible for different races and for states in varying stages of economic development to establish peaceful and cooperative relations.

Our present civilization is characterized by interdependence and it is, therefore, desirable that some common and satisfactory basis for the conduct of international relations be found. The conclusion of this study is that the Good Neighbor policy provides such a basis.

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## PUBLIC HEALTH

### A STUDY OF THE ADMINISTRATIVE CONTROL OF WHOOPING COUGH IN GRAND RAPIDS

John Leonard Lavan, Thesis (Dr. P.H.)  
University of Michigan, 1942

This study was undertaken in conjunction with Dr. Pearl Kendrick<sup>1</sup> and her assistants, and covers the period from 1932 to 1940. The vaccine prepared by Dr. Kendrick was used throughout the entire period and the results of its use are tabulated in detail -

The position of pertussis among the diseases of childhood, and particularly its prevalence in Grand Rapids, is discussed at length. Its prevalence is tabulated by age group and by months for the years from 1928-1937 -

The use of the cough plate method of diagnosis of pertussis, which was applied by Dr. Kendrick and Miss Grace Eldering, is discussed, particularly from the angle of its value in a control program. The cough plate method of diagnosis is of great value in any control program because of early diagnoses, although its use in the release of cases from quarantine is not recommended for universal use because it is costly and because laboratory facilities are not always readily available.

The method of procedure in the immunization program used in Grand Rapids is presented and the results analyzed in detail. These analyses include not only the results obtained during the 5-year study period but also include two additional years. One of the most important features in the entire study was the use of control groups, which enabled a much more accurate and comprehensive evaluation of results.

The Grand Rapids Health Department continued the immunization program as set up originally,

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<sup>1</sup>Pearl Kendrick and Grace Eldering, "A Study in Active Immunization against Pertussis. A.J.H. XXIX [May, 1939] No.3, Sec. B., pp 137-152.

after the close of the study in 1937, but without the use of control groups. The conclusion reached at the end of the 5-year study from 1932 to 1937 was that "there was a statistically important difference in the incidence of pertussis between the vaccine-injected group and the control-group, indicating that substantial protection had been afforded to the injected group."

From 1933 there was a decided drop in the number of whooping cough cases and deaths in Grand Rapids. The most noticeable drop came in 1938 and 1939, immediately following the close of the study. Nineteen forty, however, was an epidemic year and 1,000 cases were reported. As noted by accompanying charts, 1940 was a cycle year and the increase in cases can also be ascribed to more meticulous and thorough reporting of cases by physicians, as well as better ferreting out of new and secondary cases by the nursing bureau.

However, by using the methods of Sargent and Merrell,<sup>2</sup> it was found that 80.4 per cent of the cases were prevented in the vaccinated group that would otherwise have occurred. Applying this reasoning to the city as a whole, it was found that in 1940, 8 years after the study began, the expectant number of cases of pertussis was 1152. Inasmuch as only 1,000 cases did occur, there was a difference of 152 cases, or 13 per cent of the total cases. Conclusions reached were that 13 per cent of the total cases in 1940 were prevented in Grand Rapids due to the immunization by pertussis vaccine.

An outline of a program for the control of pertussis in any community, a plan based on the results and experiences of the study in Grand Rapids, is given in detail, accompanied by charts and diagrams of organization.

It is believed that pertussis can be controlled in any community, through the use of an accepted and approved vaccine along the lines described

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<sup>2</sup>C. A. Sargent and Margaret Merrell, "Method of Measuring the Effectiveness of Preventive Treatment in Reducing Morbidity". J.A.P.H.A. XXX [December, 1940], 1435.

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## RELIGION

### VOLTAIRE, THE EXAMEN AND ANALYSE

E. Judson Humeston, Jr., Thesis (Ph.D.)  
Princeton University, 1942

The problem discussed in this dissertation is concerned with the relationships between Voltaire's deistic works and the two manuscript essays, the Examen de la religion and the Analyse de la religion chrétienne, which he published in 1765 and 1766. The latter works have been already treated by J. P. Free, C. M. Crist, and Prof. Ira O. Wade. They have been so, however, in investigations that were not made with any intention of considering the treatises in their specific relationships to Voltaire. It is the purpose of the present study to measure as completely as possible the influence which the Examen and Analyse exerted upon his thought and works. In form it follows lines similar to those employed by Prof. Morehouse in his discussion of the influence of the Testament of Jean Meslier upon Voltaire. In addition to this primary purpose we are concerned also with any evidence that may lead to new attributions of authorship of either or both of the manuscript essays, as well as to new light on Voltaire's activities as Cirey.

The sources to which we have turned in our effort to determine the above-mentioned influence are, naturally, first of all the essays themselves. The printed editions of them which were used are a copy of the eleven chapter Examen that appeared in the Evangile de la raison of 1765, and in the case of the Analyse a copy that found a place in the 1792 Paris edition of the works of Freret. This late edition was employed since it was the only one available which contained also the Notes and Preuves. Still another work remained to be controlled as a source for the study. The Analyse has been thought by some to have inspired or been the prototype of the long and

detailed Biblical commentary, the Examen de la Genèse of Mme. du Châtelet, which is known to bear a strong resemblance to the works of Voltaire. Because of this relationship and the possible rapport it may have with the Analyse we have included it in the present investigation. Finally, of course, the Mélanges form the main body in which most of Voltaire's deistic productions are incorporated. We have not hesitated, however, to turn to others of his works when some possible influence suggested itself.

In endeavoring to measure the influence of the Examen and the Analyse upon Voltaire our method has been primarily one of comparison. The study is divided into two parts. The first discusses in two chapters the historical backgrounds of the two essays, bringing up to date the known evidence regarding their dates, composition, publication, manner of being circulated, authorship, etc. The second part, which forms the largest section of this work, consists of seven chapters in which we have compared the arguments which appear in two or more of the four works under consideration: the Examen, the Analyse, the Genèse, and the Mélanges. Where the Genèse and Voltaire alone are concerned we have omitted all discussion inasmuch as that relationship has already been treated by Prof. Wade. In each chapter we have tried to indicate the similarities and differences in both general attitudes and specific examples of the arguments that are used in common by the essayists and Voltaire. The conclusions sum up the evidence resulting from these comparisons and present two positive results which, it is hoped, may be accepted as a not unworthy contribution to the study of the development of rationalism in the thought of eighteenth century France. By reason of them there is added one more to the growing list of studies tending to make clearer the fact that French deism, in spite of an undeniable English influence, preserved an identity and continuity which were not formerly recognized. They are conclusions which, unless the contents of the Examen be proved other than French in origin, confirm Voltaire's debt to the works



of his countrymen, and in any case help to complete the picture of his own productions of the Cirey period.

The first of the results is the belief that the Examen and the Analyse exercised a considerable and incontrovertible influence upon Voltaire. From the comparisons there stand out a notable number of unassailable examples of borrowing and an impressively large group of instances that so strongly suggest a real influence upon the deistic works of Voltaire as to warrant the statement that these two manuscript essays were as important to his development as was the Extrait of Meslier, and further, that he employed them in much the same fashion and to the same degree. The second result is one which in interest and importance overshadows the one we have just mentioned. It is that these comparisons make it possible at last to establish with some degree of certainty the authorship of the second of the two essays. Whereas before the Genèse and Analyse had been compared it was reasonable to attribute the latter to as many as four different persons, we now have evidence which leads almost inevitably to the belief that Voltaire, and Voltaire alone, is the author of the Analyse. We can henceforth accord to it a logical and fitting place in his deistic productions and regard it as a storehouse for ammunition which he used in many of his later works.

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THE "POLYGLOT" ARABIC TEXT OF ZECHARIAH--A  
COMPARATIVE AND CRITICAL STUDY

Stephen M. Reynolds, Thesis (Ph.D.)  
Princeton University, 1939

The Arabic version of the Major and Minor Prophets found in the Paris and London Polyglot Bibles is preserved also in a number of manuscripts of which one in Paris, Bibliothèque Nationale, Arabe No. I, from which the Paris edition was prepared, is the most important. The London Polyglot text is a good copy of the Paris edition but the editor of the former did not have access to the manuscript.

From a photostatic copy of the Paris manuscript in comparison with the two Polyglots the present writer has critically examined the text of Zechariah and has compared the readings with those of the various manuscripts of the Septuagint, of the Peshitta and of the various Hebrew manuscripts as collated by Kennicott and de Rossi.

The Arabic manuscript was copied by a Moslem named 'Abd Rabbiḥ who completed his work in December 1584 A.D. as we learn from the colophon at the end of Malachi. The scribe states that the translator of the version was a learned ecclesiastic named al-'Alam the Alexandrian and that he translated from an old Greek uncial manuscript. Alb. Vaccari about 1921 brought to light the fact that the word litun used in the colophon is a transliteration of the Greek word liton (accusative of litos) which he proved meant uncial. In the present study further evidence that the Greek manuscript from which the Arabic version was taken was uncial is found in the reading of Zechariah 11,7 where the Septuagint reads emautō while the Arabic has 'alayhim. This change from unto me to against them can best be explained by supposing that the Arabic was translated from a Greek uncial manuscript



without breathings, accents or word divisions. The Greek emautō was mistaken for ep'autō, a mistake very easy to make in this type of manuscript. The translator understood the antecedent of ep'autō to be a collective singular which he chose to render as a plural.

The date of the translation is ascribed to about the tenth century from linguistic evidence. The translator is shown to be a learned man whose Arabic was influenced somewhat by the Syriac language and whose treatment of the text, while following almost altogether his Greek original, was slightly influenced by the Peshitta translation. He is called "the Alexandrian" in the colophon; so we conclude that he was a Syrian who lived and worked in Alexandria. The influence of the Syriac language on the translation is found in such words as jirbiyā' in the sense of north. This word, while known to the Arabic lexicographers in the sense of north-wind, is apparently practically unique to our translator in the sense of north as a point of the compass. The derivation is from Syriac garbya the regular word for north.

The influence of the Peshitta is inescapable in a few passages of which 7,2 is the most striking. In this verse the personal name Rabmāgh occurs. This is not from the Septuagint which has in its various manuscripts Arbeseser or some variation thereof, nor from the Hebrew of the Masoretic text which has Regem-melekh, but is from the Peshitta which has Rabmāg.

The Arabic version (abbreviated (A)) was translated from a Greek uncial manuscript of the type of codices Alexandrinus or A and Marchalianus or Q and of certain minuscules agreeing with them which were classified by Procksch as group II. Of these the more important in the Minor Prophets are 106, 26, 86, 198, 233, 40, and 41. Twenty-two important agreements of (A) with AQ against codices Vaticanus and Sinaiticus were found in Zechariah, while only seven important agreements of (A) with the last two against AQ were found.

A study of the comparative relationship of (A) to A and Q respectively showed that (A) stood with



Q thirty-two times against A and with A only eleven times against Q. The faults of A were found to be glaring, and it appears that it suffered at the hands of careless scribes who made it diverge more from its Hebrew prototype than did the original Septuagint, and also that it has been emended in certain passages to conform to the Hebrew where (A) and Q preserve a more ancient Septuagint tradition. For example, in 14,10 the reading of Q, Gabel, and of (A), Ghābāl, can only be explained as an error going back to the Hebrew and not as an inner Greek error. The lambda or lām appears either as the result of an error of the man who translated the passages into Greek or else the extra letter existed in the Hebrew text from which he worked. It cannot be explained as an inner Greek error. The Masoretic text reads migGeba' l<sup>e</sup> Rimmon. The Greek translator appears to have taken the lamedh of l<sup>e</sup> Rimmon as the last letter of Geba' and to have repeated it in its proper place. The other possibility, that the dittography existed in the Hebrew which the translator used, would also take the reading of (A) and Q back directly to the Hebrew.

The conclusion from the evidence gathered is that (A) and Q are quite close together in Zechariah, and that together they represent a smaller group within the AQ II group that is much superior to A as authority for this important type of Septuagint text. The present writer believes that AQ 106 et al. are Origenian-Constantinopolitan corresponding to the type represented in Daniel by AQ 106, 36, 230, 42 and (A) classified in that way by Dr. Montgomery. The importance of the AQ type has been increasingly recognized with regard to the study of the original Septuagint and hence of the Hebrew text at the time the Greek translation was made. That it represents a type of Septuagint frequently quoted in the New Testament has also been recognized. Dr. Henry S. Gehman has shown that in Daniel (A) is superior to Codex Alexandrinus and the present study shows that the same thing is true in Zechariah, in which book (A) and Q are members of a smaller and superior group within the AQ II group.

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## SOCIOLOGY

### THE ENGLISH COUNTRY GENTRY: A SURVEY WITH SPECIAL REFERENCE TO THEIR SOCIAL CODE

Paolo Enrico Coletta, Thesis (Ph.D.)  
University of Missouri, 1942

The English gentry stem from Rome's Imperial Procuratores, who in succession became Germanic comes, Saxon thanes, and medieval knights. Each of these was distinguished from the nobility because untitled, from plebeians by their large landholdings, superior economic resources, gentle blood, military functions, certain social and legal privileges and responsibilities, and by their control over their dependents' destinies. The Teutonic and Saxon states had two types of comes, the gesith and the thane who took over his military character and obtained grants of terra regis. There were kings' thanes and lesser thanes, both vassals with clearly defined class privileges and obligations. Thanes were warriors rather than agriculturists. Thanage was not a caste--men with sufficient land and traders, with qualifications, became thane-worthy. The thane was the prototype of the knight, the heriot of the relief, the fyrd of the knight's fee. Knights supplanted thanes a generation after the Norman Conquest. Then, in the thirteenth century, knights formed part of an aristocratic class composed of gentle men, whether knights banneret or bachelor, or esquires. All men refusing knighthood after distraint remained squires: scutage transformed feudatories into country gentlemen.

Some of the reasons for the power of the gentry class since the thirteenth century are:

- 1) their ownership of most of the land of England;
- 2) their gratuitous services as justices of the peace;
- 3) their control over county elections from 1430 to 1832 which allowed them to monopolize the House of Commons;
- 4) their adaptability to such new phenomena as Trade, Industrialism, and Democracy;
- 5) their con-

trol of the Army, State, and Church offices, and their monopoly on the Universities and organs of public opinion; 6) their opposition to absolutist government which made possible a constitutional monarchy which allowed them to formulate domestic policies; 7) their settlement on the land and their care of their tenants and the poor; 8) their creation of a patriarchal regime perpetuated by tradition and conservatism; 9) their possession of most of the characteristics of English gentlemen; and 10) their open-air existence which precluded the emasculation which often marks a leisured class.

The power of the squirarchy declined after 1832 but still lives on. Democracy has lessened their control over Government, the repeal of Protection had denied them economic privilege, and the growth of town wealth, the spread of education, and the railroad net have made it possible for one to be a gentleman without owning land. But the squirarchy still owns most of the land and retains the social prestige, the political power, and the moral sway which attaches to English land. Civil servants now administer a State program of social legislation covering those matters in which the squire's word had been law, and squires have been deprived as justices of most of their powers. But until the advent of the civil service no aristocracy the world over gave its country the good and inexpensive government the squirarchy has given England.

Data has been secured from diaries, memoirs, and biographies of English squires; from literary sources dealing with the class structure, land question, and governmental problems of England; and from the original writings of men concerned with the education, manners, leisure avocations, and occupations of the squire as the ideal English gentleman. The major Italian courtesy works have been studied and their influence upon the English squires described.

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## THE AMERICAN COLONY IN MEXICO CITY

Ethelyn Clara Davis, Thesis (Ph.D.)

University of Missouri, 1942

The three thousand United States citizens who comprise the American Colony in Mexico City do not, in their adjustments to a new situation, follow the patterns common to most immigrant groups in this country. From necessity and from choice they have accommodated to certain features of Mexican life and in the areas of housing, food, clothing, and servants Mexican culture predominates. Rather than participating in Mexican activities and being assimilated into Mexican culture, these persons have established institutions for the preservation of their own culture and have developed a social life distinct from that of Mexican society. Information concerning the life of these persons has been obtained through interviews with them, through a study of their institutions and social organizations, and through several years of participation in the life of the Colony.

The American School Foundation has been established to provide an education following approved patterns from the United States. It also serves as a means for the formation of friendships among children who, without a neighborhood or friends near-by, must find other sources for contacts. Although religion is of little concern to most Americans in Mexico, the Union Evangelical Church is purely an American institution and separate English services are held at the Catholic and Christian Science Churches.

The social life of the American involves much elaborate entertaining. The Colony is divided into many cliques whose interests and activities vary greatly. Wealth is not related to the group which a person chooses except in so far as it permits or limits participation in certain activities. The status of all members of the Colony is sufficiently

alike to make wealth a matter of little concern. Twelve American organizations, most of which include members of other nationalities, serve the American Colony.

Lack of segregation has not produced increased assimilation, since friendships are made through organizations and have no relation to the part of town in which a person resides. There is no area of first settlement nor is there a pattern of movement within the city. However, the Americans are very mobile.

American children tend to follow the pattern of their parents rather than adopting Mexican culture. A life of constant care by servants, the mixture of Spanish and English in speech, and the culture acquired from Mexican maids and American parents makes them different from Mexican children or from their countrymen in the United States.

Not all Americans in the City are included in the American Colony and hence have not been included within the scope of this investigation. These are usually American women married to Mexican men who have no opportunity for American contacts. However, many couples of mixed nationalities do participate in the life of the Colony. Similarity of culture seems to be more important in the success of marriage than is nationality.

The chief difference between the American Colony in Mexico and an immigrant group in the United States may be attributed to the higher economic status of the Americans. From this arise other factors which cause the American to accommodate successfully but to acquire Mexican culture to a small degree. The American likes Mexico. He feels that it offers him an opportunity to combine the features of two cultures into the life which he finds in the American Colony.

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SUBJECTIVE FACTORS OF DELINQUENT CONDUCT: AN  
ADAPTATION OF "OWN STORY" AND INTERVIEW  
METHOD TO THE DIAGNOSIS AND REHABILITATION  
OF DELINQUENT BOYS

Ralph Aloysius Gallagher, S.J., Thesis (Ph.D.)  
Saint Louis University, 1932

The fundamental cause of delinquent conduct lies within the individual himself. It is the delinquent or anti-social act which he has posited that stigmatizes the boy a delinquent, and the why of this act has been the chief concern of this research.

An effort has been made in this study to understand the normal individual delinquent as he is, through a specific method termed the "Own Story" approach. This life-history method means that the boy not merely tells his story but endeavors to assign reasons for his acts and thus consciously or unconsciously often exposes the source of his misconduct.

Original scales or tests, intended to measure attitudes, ideals and conflicts which the author often found to be the source of anti-social conduct, were devised and developed by him. These scales, as applied to the "Own Story" of the boy and a method of reconstruction, are new contributions to the study of the delinquent.

The laboratory of the author has been extensive. Five hundred cases, or "Own Stories," of individual boys in New York, Ohio, Illinois and Missouri were studied, diagnosed and the scales above mentioned applied. The conclusions were carefully tabulated. Fifty cases of delinquent boys were studied intensively, a process of reconstruction applied, and the results noted.

The failure both on the part of public and private agencies to bring about reform in the past is noted and a positive process of prevention proposed.

The case-work method has been applied throughout the thesis. Results in general, have

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THE DEVELOPMENT OF A TECHNIQUE FOR EVALUATING THE  
ORGANIZATION OF DIOCESAN CATHOLIC SOCIAL  
INSTITUTIONS

Weltha M. Kelly, Thesis (Ph.D.)  
Saint Louis University, 1937

The study indicates the paths of growth and development that have been followed by Catholic social work. It makes plain the necessity for evaluation and improvement which still remains even in our present-day systematic and efficient administration of Catholic social agencies.

The conclusions arrived at in this study are the result of a group of surveys comprising all the existing social agencies and institutions within one Catholic Diocese. The organizations under inspection included the diocesan social agency established for service to the laity in the episcopal city and in the surrounding communities; an institution for delinquent girls; an institution for dependent children; and a home for unmarried mothers.

In analyzing and evaluating the set-up and function of each agency, the author indicates such deficiencies as show the need of more perfect scientific methods and the application of more approved techniques of modern social case work. The survey of each institution, as a result of the revelations made, led to a formulation of the features of correction which would best suit its needs. In thus perfecting the formulae applicable to creating the most efficient service for a particular phase of social work activity, the composite of all methods resulted in the development of a specialized set of methods or, in other words, the technique that can be used to best advantage in evaluating other agencies of like nature and program.

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## THE ECOLOGICAL DISTRIBUTION OF TALENTED PERSONS IN THE UNITED STATES

Arthur Hampton Robertson, Thesis (Ph.D.)  
University of Michigan, 1933

The purpose of this research in Human Ecology is to test the theory that cultural advantages become more diffused throughout the United States as the character of our national economy changes from that of rural pioneering to one of urban dominance. Local frontier areas, once forced by rudimentary defense needs to depend upon policies of self-support, now receive ideas and ideals from metropolitan sources. Through systems of improved communication, information is disseminated through a network of cities which exist more or less in a state of mutual rivalry. The result is greater uniformity in ideas, including home furnishing, dress, entertainment, and morality practices, than prevailed during an earlier period in our national economy.

The thesis was completed during the years of 1932 and 1933 at the University of Michigan. Sources of statistical data were four decennial issues of "Who's Who in America." - 1900, 1910, 1920, 1930 - and Federal Census Reports on Population for the same periods.

Criteria for determining the comparative diffusion of culture are the individual Who's Who registrants who reside in given areas or cities which are used as units for analyses. The proportion of the total local population which is represented by Who's Who enrollees is the ratio by which comparison is extended to a variety of population groupings. These units of geographic representation include the eight Divisions as used by the United States Census, the states, and cities. The latter are classified according to sizes in total population. Integration of

local interests and living standards in any location is expected to benefit populations relatively, the degree of variance being the ratio between the number of talented persons and the total population of the community.

Investigation of Who's Who registrants included three particular lines of inquiry - spatial distribution, occupational comparison, and place of origin by birth.

Spatially considered, New England, Middle Atlantic, and the East North Central Divisions of the country show a relative decline in the rate of leadership, while the South Atlantic and West South Central Divisions reveal ratio increases of 82.3 and 92.0 percent respectively. Comparison by states shows equally contrasting results. Areas lying south of the Ohio and Potomac and west of the Mississippi Rivers reveal greatest growth in proportional leadership. Oklahoma and Georgia lead with increase of 109 and 96.4 percent respectively, while Massachusetts and New Jersey show greatest losses by declines measured by 30.1 and 24.1 percent respectively. Cities of 50,000 to 100,000, located west of the Mississippi lead those east by a ratio of almost 3 to 1, while cities of 2,500 to 50,000 in the more westerly area lead those in the eastern sections at odds of almost 6 to 1.

Occupations of Who's Who enrollees, when classified reveal definite shifts in the relative importance of selected groups. General Business, Manufacturing, and Scientific classes record increases, while Legal, Public Office, Writers and Medical and Surgical groups reflect a decreasing prestige. The most notable exception to the rule is the Manufacturing group in the Middle Atlantic area. Here the customary downward trend in classified representation is reversed into an increase. (These downward changes, however, are only proportional to the total population, not numerically actual, a fact to be explained by the increase in Who's Who biographies from 16,169 in 1900 to 33,386 in 1930.)



Birthplaces of the nation's leading citizens, when tabulated geographically, confirm the general thesis of a shifting importance in cultural prestige. New York and Massachusetts show a relative decline as production centers of distinguished personalities, whereas Illinois, Michigan and California make increasing contributions, not only to their own metropolitan centers, but also to New York City.

The summarized conclusion is that there is a growing decentralization of talented persons. This movement is concurrent with a general levelling in economic advantages. Culture in the United States is becoming more diffused. The trend in relative importance is away from the once acknowledged leadership of the Atlantic seaboard to a rapidly increased prestige of areas farther west and southeast. American culture of the future promises to spring more and more from areas previously considered as incapable of influencing national development.

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TREATMENT OF LIFE INSURANCE PROBLEMS BY SOCIAL  
AGENCIES DEALING WITH DEPENDENT FAMILIES

Flora L. Slocum, Thesis (Ph.D.)  
Saint Louis University, 1937

Life insurance, because of its phenomenal growth, is a widespread economic institution in the standard of living of urban families. A study made in St. Louis before the depression indicated that approximately 95 per cent of the families receiving assistance from a family welfare agency had dealt with life insurance companies at some time or other; 73 per cent still had insurance in force; and at least 35 per cent had non-forfeiture values in lapsed policies about which they were apparently unaware. The extent of insurance is probably similar at the present time.

Deep-seated desire for the security of burial protection and savings explains the insurance practices of families. The policy of ignoring life insurance, or attempting to forbid its existence in the family budget, may invite subterfuge in the client's relationships with the social agency. Experience shows that families which regard life insurance as necessary to their security will have insurance by one means or another. Although an agency does not make direct provision for life insurance through payment of premiums, it nevertheless contributes indirectly to the maintenance of life insurance in the family budget by giving relief for other budget items. If life insurance is dealt with as one of the needs of the family, just as any other item of the budget, a social agency has many opportunities to show the family how to secure the most life insurance for the smallest outlay; and also how to make the wisest choice of non-forfeiture values when the family circumstances preclude the continuance of premiums.



An examination of cases shows that social workers can conserve the benefits which may be made to accrue from life insurance established in the budget by the family prior to the family's need of relief. Two kinds of problems are dealt with:

a. Families needing adjustment of premiums and policy plans.

b. Families requiring help in the recovery of lost or unclaimed resources or benefits about which they are often unaware because of an unfamiliarity with policy provisions or State insurance laws.

Life insurance plans made with 1163 families in St. Louis are examined and summarized. Premiums in force, subsequent to the need of relief, are approximately \$7,832 per month for insurance amounting to \$2,754,286. Premiums were equivalent to approximately 24 per cent of the relief supplied. Plans made with families and their insurance companies for the economic adjustment of this insurance resulted in premium reduction of 55.7 per cent and reduced the insurance protection by only 38.7 per cent. The insurance plans developed reserve refunds amounting to \$128,288 in cash, and annual premium economies approximating \$52,366. Potential savings in relief and in family resources are derived from the reserve refunds available in cash and the substantial reduction in premiums provided satisfactory budget plans are made with the families for the use of the reserve refunds obtained.

The research, illustrated by case examination, was pursued in response to the social worker's need of orientation to the subject of life insurance and to the possible methods of dealing with insurance problems. Standard works on life insurance are undapted to the needs of social workers who are seeking an understanding of life insurance sufficient to enable them to cope with life insurance problems among families in need of relief.

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## ZOOLOGY

### SEASONAL AND EXPERIMENTALLY INDUCED CHANGES IN THE REPRODUCTIVE TRACT OF THE FEMALE BAT MYOTIS GRISESCENS

Jane Colburn Belcher, Thesis (Ph.D.)  
University of Missouri, 1940

Seasonal changes and those induced by hormone treatment in the reproductive tract of the female bat *Myotis grisescens* were studied cytologically. The purpose of the work was to augment the existing information concerning the relation between hormones and cellular activity, and related problems. The study of the cellular origin of ovarian hormones and their separate roles in stimulating cellular differentiation in the reproductive tract is confused in the common polyestrous laboratory mammals whose ovaries may contain follicles in all stages of differentiation, as well as corpora lutea in various stages of differentiation and regression. Such confusion is obviated in the sexually mature bat since its ovaries contain secondary follicles throughout the year, the tertiary follicle of ovulation is distinguishable from September until the time of ovulation in April, and a corpus luteum exists only during gestation. Particular attention was given in the present study to possible correlations between the effect of hormone environment on the life history of the cell - its growth, division, differentiation, functioning, and eventual degeneration.

The vaginal response to estrogen stimulation was an increase in cell division as indicated by a thickening of the mucosa and a cornification of the cells near the lumen, and vesiculation and accumulation of fat droplets in the germinativum, rete, and granulosa. The latter response was interpreted as indicating an abortive differentiation of these cells as secretory cells. The uterus responded to estrogen by a differentiation of the secretory cells



of the endometrium to a functional state; increased cell division in the glandular epithelium as reflected by the increase in length of the glands; increased vascularity in the stroma; gathering of wandering cells in the mucosa, and a thickening of the uterine wall. The tubal response to estrogen was an increased number of secretory processes in the epithelium.

The reproductive tract gave evidence of estrogen stimulation from July, when the ovary possessed only secondary follicles, until April, the normal time of rupture of the tertiary follicle of ovulation. Tract changes similar to those occurring in the normal cycle could be induced by injections of estrogenic or gonadotrophic extracts.

The vaginal response to estrogen was inhibited by some concentrations of progestin. Endometrial differentiation was augmented when progestin secretion or injection followed estrogen stimulation, the degree of augmentation varying directly with the amount of priming by estrogen within the range employed.

The estrogen threshold of the endometrium was higher than that of the vaginal mucosa from August through April. The condition of July specimens suggested either that the endometrium at this season had a lower threshold than the vaginal mucosa or that an earlier estrogen effect on the vagina had worn off.

Progestin stimulated differentiation of secretory cells in the tubal epithelium. These cells differed from the usual tubal secretory cells in three respects: 1) they were found in greatest numbers in the isthmus; 2) they did not form secretory processes; and 3) secretory granules differentiated basal to the nuclei before passing to the luminal ends of the cells.

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ALTERATIONS IN THE BLOOD, AND IN THE WATER, FAT,  
AND CHLORIDE CONTENT OF TISSUES DURING  
DEHYDRATION IN THE DOG

Benjamin DeBoer, Thesis (Ph.D.)  
University of Missouri, 1942

The effects of chronic dehydration by water and food deprivation upon weight, and upon blood and other tissues were studied in 24 dogs. Comparisons were made with the effects of acute dehydration brought about by the oral administration of magnesium sulfate, by the injection of 50 per cent sucrose and of 25 per cent sodium chloride, and by hemorrhage.

Data on water, chlorides, fat, and the iodine number of the fats were based upon analysis of 172 samples of skin, muscle, blood, liver, intestine, and spleen taken from 16 dogs. Changes in hemoglobin, erythrocyte count, and blood specific gravity were followed during dehydration and recovery. Hemoglobin was determined with the use of a Cenco-Sheard-Sanford photelometer, and specific gravity by the Barbour Hamilton method.

Tissue samples were obtained using aseptic procedure with the dog under sodium pentobarbital anesthesia. The amount of water present in each sample was determined by drying at 103° Centigrade. Fats were removed by ether extraction. Chlorides were determined by the Van Slyke-Sendroy method with a preliminary digestion with KOH according to Sunderman. The fats extracted from muscle and skin were tested for unsaturation using the Hanus modification of the Hübl method for iodine number.

In the operative experiments normal tissue samples were removed from each dog prior to chronic or acute dehydration. In the second operation pieces of tissue were removed from the corresponding body region on the opposite side to make comparisons more accurate. Some dogs were allowed to recover, on



normal diet, following chronic dehydration, and a third set of samples was taken for comparison with the experimental and normal samples. Blood changes were followed both in the 16 operated dogs and in 8 unoperated dogs during the course of chronic or acute dehydration.

The analyses demonstrated that determinations of tissue water must be based on fat-free material.

The chronic dehydration resulted in a 10 per cent loss of body weight in 3 days and 25 per cent loss of weight in 9 days. More than one-half of the loss of weight was estimated to be due to a loss of water from muscle, skin, and blood, being 35 per cent, 15 per cent and 5 per cent respectively. Skin showed the greatest percentage decrease in water (5 per cent), the decrease in muscle and blood being about 1 per cent each. During the period of dehydration the concentration of the chlorides in the water of the tissues increased 60 per cent in skin, 32 per cent in blood, and 14 per cent in muscle. An increase in hemoglobin, erythrocytes, and specific gravity during the first few days was followed by a decrease when dehydration was carried beyond one week. No changes in the iodine number of the fats were found.

Acute dehydration produced by hemorrhage or the injection of hypertonic sucrose in the normal dog was accompanied by a 7 per cent decrease in the water of the skin, no changes in muscle and an increase of 2 per cent in the blood. The chloride content increased 23 per cent in the skin, and 4 per cent in the blood, but decreased 22 per cent in muscle. Changes in hemoglobin, red blood cell count, and specific gravity were pronounced in dogs not previously dehydrated. Acute dehydration by hemorrhage produced little change in a dog which had previously undergone chronic dehydration.

During recovery from chronic dehydration the body weight increased rapidly the first 2 days, decreased, and then gradually reached normal. The muscle recovered more rapidly than the skin. The blood showed an increase in water content and an

abrupt decrease in hemoglobin, red blood cell count and specific gravity. The normal values were restored as general recovery proceeded.

It was concluded that the skin acts as an emergency regulator of body water and that this tissue is particularly adapted for this function. It was also noted that there is marked conservation of chlorides during dehydration. The skin appears to serve as a storage place for excess chloride.

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EMBRYONIC DEVELOPMENT AND ADULT MORPHOLOGY OF BLOOD  
AND BLOOD-FORMING ORGANS IN THE FROG, Rana pipiens

Paul H. Ralph, Thesis (Ph.D.)—  
University of Michigan, 1942

The paper is concerned with the morphology and behavior of mature and developing blood cells in the frog and such facts regarding the function of these cells and the blood-forming organs as could be ascertained. Living cells, both unstained and stained supravitaly were studied in bright- and darkfield. Wright's stained smears of organs and blood were studied in bright- and darkfield. Sections of embryos and organs of adult frogs were also observed. Many experimental procedures were employed to determine the nature of the "Golgi apparatus," cell membrane, mitochondria and other organoids of the cells. Emphasis was placed upon the fact that the living untreated cell should be the basis of all descriptions of morphology. Great care was taken to distinguish between actual structures and artifacts induced by treatment to which the cells were subjected. Designation of color in structures was made as objective as possible by comparison with a standard color nomenclature.

In the blood of the adult frog erythrocytes, thrombocytes, neutrophils, eosinophils, basophils, monocytes and lymphocytes were found. In all cases these cells could be distinguished from each other on the basis of specific cytoplasmic granules. These granules were not designated by names but by letters since their functional, chemical and cytological identity is in most cases obscure. These cell types may be further distinguished on the basis of nuclear structure, the staining reaction of cytoplasm and nucleus, and the behavior of the living cell. No cytogenetic relationships were disclosed between the seven kinds of cells present in the circulating blood

of the adult frog. Detailed descriptions are given of amoeboid movement, lytic degeneration of the thrombocyte, and alterations which take place in the living cells as a result of their exposure to in vitro conditions and various reagents.

The first blood cells formed in the larva of Rana pipiens are the primitive erythrocytes which develop in the blood islands, thickened cushions of mesoderm ventral and lateral to the gut. They are derived from an autonomous anlage which is differentiated shortly after gastrulation. The blood islands are made up entirely of primitive erythrocytes and these cells give rise only to more erythrocytes. All of the primitive erythrocytes are formed in the blood islands.

The secondary blood cell line is derived from the general body mesenchyme. The mesenchyme cells cytomorphose into primitive blasts which may develop into primitive monocytes, primitive basophils, and primitive phagocytes in the tissue spaces and circulation.

Hematocytopoietic tissue accumulates in the dorsal mesentery of the gut (diffuse spleen), the intertubular spaces of the pro- and mesonephric tubules and in the definitive spleen. These hematocytopoietic cells all originate from the primitive blasts which either migrate from the mesenchyme or are left in these loci by the circulation. The pro- and mesonephroi give rise to erythroblasts, neutrophils, monocytes, eosinophils and polymorphonuclear mast cells, the definitive spleen gives rise to lymphocytes, reticulo-endothelial cells and phagocytes. The development of erythrocytes in the larva is largely intravascular. Accumulations of erythroblasts are found in the liver sinusoids during later embryonic life but they do not originate from the liver cells.

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PERIODICITY OF SPONTANEOUS CHANGE OF FORM OF  
PELMATOHYDRA OLIGACTIS UNDER VARYING  
PHYSIOLOGICAL CONDITIONS

Rev. Raymond Hugo Reis, S.J., Thesis (Ph.D.)  
Saint Louis University, 1940

Although the morphology and physiology of the common fresh-water polyp, Pelmatohydra oligactis, have been the subject of repeated study, yet the behavior of this form has been neglected. Numbers of these hydras were subjected to continuous half-hour observations during which time measurements were made of such components of the action system as: number, magnitude in millimeters, time required, etc., of successive cycles of activity. Groups of these polyps - 20 in each series - were observed under varying physiological conditions to determine the effect on the different components of the action system.

From five to twenty elongations were found to occur in a half-hour period. The spatial pattern is composed of successive expansions many of which are unequal in extent. The repeated changes of form, however, in some polyps were at times highly rhythmical. Six rhythmical spatial patterns were found in the mature forms as well as in buds. There was no corresponding regularity in the temporal pattern.

In satiety the number of cycles of activity increased, but the amplitude of the expansions decreased. The temporal factor was not affected.

During starvation the magnitude of the elongations was gradually diminished, but the number of extensions was not affected. Starvation did not noticeably modify the temporal pattern.

Bud development probably restricted the extent of the variation in the number of changes of form of the parent, but apparently did not influence the temporal pattern of the parent.

Depression caused a rapid decrease in the magnitude of the expansions, but had no effect on the

number of the elongations. The temporal pattern was noticeably affected as during each daily observation a long period was spent in a completely motionless state.

Buds while attached to the parent also manifested a variation in the number and amplitude of successive cycles of activity; after separation from the parent the young polyps attained elongations of greater magnitude. The time required for expansions of the same extent was greater before than after detachment from the parent.

These observations showed that the action system of Pelmatohydra oligactis is composed of changes of form varying to a high degree both in magnitude and frequency. The sequence of expansions is at times highly rhythmical. The spatial or temporal patterns are modified by such factors as: satiety, starvation, depression, and budding. Buds before detachment from the parent manifested the essential features characteristic of the action system of mature hydras.

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